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MEMORANDUM

Subject: Registration Review: Revised Preliminary Problem Formulation for Ecological Risk, Environmental Fate, Endangered Species, and Drinking Water Assessments for Pirimiphos Methyl

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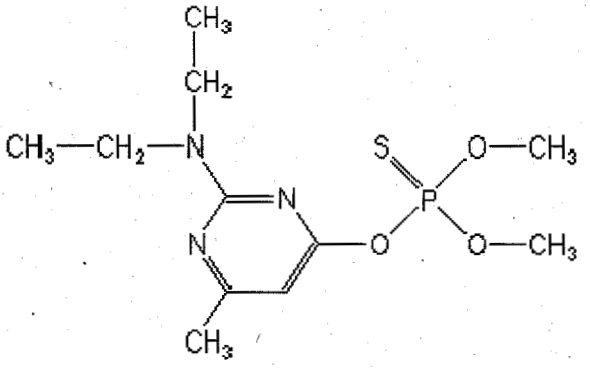
The Environmental Fate and Effects Division (EFED) has revised the preliminary problem formulation (attached) for pirimiphos methyl (PC Code 108102). Revisions were completed in Section 7.7 of the document concerning the Drinking Water Assessment to support registration review. Please call Gabe Rothman at (703) 347 – 8011 for any questions.

United States Environmental Protection Agency

Office of Prevention, Pesticides, and Toxic Substances

Problem Formulation for the Environmental Fate, Ecological Risk, Endangered Species, and Drinking Water Assessments in Support of the Registration Review of Pirimiphos Methyl



Pirimiphos Methyl (CAS 029232-93-7)

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1. Purpose

This document functions as a problem formulation characterizing the potential environmental fate and ecological effects of pirimiphos methyl, an organophosphate compound registered nationally for use as an insecticide on stored grain and cattle ear tags. There are also special local needs labels for uses on iris in Washington state and gladiola bulbs in Michigan. The problem formulation will provide a framework for analyzing and interpreting data relevant to the environmental fate, ecological risk and endangered species effects of pirimiphos methyl. Any data gaps or uncertainties will also be discussed and addressed.

2. Problem Formulation

2.1. Nature of Regulatory Action

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), all pesticides distributed or sold in the United States generally must be registered by EPA. In determining whether a pesticide can be registered in the U.S., EPA evaluates its safety to non-target species based on a wide range of environmental and health effects studies. In 1996, FIFRA was amended by the Food Quality Protection Act, and EPA was mandated to implement a new program for the periodic review of pesticides, *i.e.*, registration review (http://www.epa.gov/oppsrrd1/registration_review/). The registration review program is intended to ensure that, as the ability to assess risk evolves and as policies and practices change, all registered pesticides continue to meet the statutory standard of no unreasonable adverse effects to human health and the environment. Changes in science, public policy, and pesticide use practices will occur over time. Through the new registration review program, the Agency periodically reevaluates pesticides to make sure that as change occurs, products in the marketplace can be used safely.

As part of the implementation of the new Registration Review program pursuant to Section 3(g) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Agency is beginning its evaluation of pirimiphos methyl to determine whether it continues to meet the FIFRA standard for registration. This problem formulation for the environmental fate, ecological risk, endangered species, and drinking water assessment chapter in support of the registration review will be posted in the initial docket opening the public phase of the review process.

2.2. Previous Risk Assessments

Pirimiphos methyl was originally registered for use in the United States in 1978. It is currently used to treat stored corn and sorghum seed and grain, and on beef cattle, non-lactating dairy cattle, and calves through ear tags. There are also two Special Local Needs Registration Section 24(c) labels. The Washington State label applies to fogger treatment for iris within indoor nursery facilities. The Michigan label contains indoor uses for gladiola bulbs using fogger, bulb dip, and drench treatment methods.

The Agency conducted a previous national-level ecological risk assessment on pirimiphos-methyl during the reregistration phase. Conducted in 1998, the previous ecological risk assessment supported the most recent IRED, completed in June 2001. The IRED was a cumulative decision for all organophosphate pesticides. Pirimiphos-methyl was categorized as highly toxic to birds, fish and invertebrates on an acute basis. Despite this high toxicity to a range of organisms, none of the Agency's levels of concern (including those for endangered species) were exceeded for the registered seed treatment use. The 1998 document concluded that because pirimiphos methyl is primarily used in closed systems when applied to seed, grain and bulbs, the only potential environmental exposure from registered use is to terrestrial wildlife from ingestion of treated seeds. No mitigation strategies were proposed for ecological risk (US EPA, 2006).

Since the IRED, EFED has been informed of scenarios whereby seeds, treated with pirimiphos methyl during storage, can be planted the next season. In addition, risk to aquatic organisms may exist due to other labels for cattle ear tags. Therefore, this problem formulation will present the comprehensive ecological risk assessment analysis plan addressing the potential subsequent off-site movement of pirimiphos methyl.

3. Stressor Source and Distribution

3.1. Mechanism of Action

Pirimiphos methyl [O-(2-Diethylamino-6-methylpyrimidin-4-yl) O,O-dimethyl phosphorothioate] is in the organophosphate class of chemicals. Pirimiphos methyl acts specifically as a cholinesterase (ChE) inhibitor. The organophosphate interacts and binds ChE and decreases the activity of the enzyme. The process whereby ChE breaks down excess acetycholine, an organic nutrient, is necessary to maintain nervous system functionality (Cremlyn, 1991). Pirimiphos methyl is applied to control post harvest pests including a variety of small adult insects including cigarette beetle, confused flour beetle, corn sap beetle, flat grain beetle, hairy fungus beetle, red flour beetle, sawtoothed beetle, granary weevil, maize weevil, merchant grain beetle, rice weevil, lesser grain borer, and angoumois grain moth, Indian meal moth, and almond moth. In addition, pirimiphos methyl controls horn flies and face flies that can dwell on cattle hide (US EPA, 2006).

3.2. Overview of Pesticide Usage

There are a number of active Section 3 products containing pirimiphos methyl. A number of labels are for the treatment of corn or sorghum seeds and grain for immediate storage. Several other labels exist for treated ear tag products applied to beef and non-lactating dairy cattle or calves. Pirimiphos methyl ear tags ultimately results in residues being absorbed by the hide of cattle. There are also two special local needs Section 24(c) labels. The Washington State label is for indoor fogger treatment on iris. Michigan labeled uses include dip and drench treatment to gladiola bulbs and indoor fogger treatment for gladiola bulbs. According to OPPIN, cancellation is pending for the

Michigan label. **Table 1** shows the each label, uses, and maximum application rates of pirimiphos methyl for each use.

Table 1. Pirimiphos methyl end-use labels and application methods.

Label	Formulations	Application Method	Maximum Application Rate per Treatment	Maximum Number of Applications per Season	Intervals between Applications
Dominator® Insecticide Ear Tags	20% Pirimiphos Methyl Solution on Eartags	Direct Application to Beef and Non-Lactating Cattle and Calves	3.84 g a.i. per animal [1]	1	N/A
Double Barrel ® Insecticide Ear Tags	14 % Pirimiphos Methyl on Eartags	Direct Application to Beef and Non-Lactating Cattle and Calves	2.66 g a.i. per animal [2]	1	N/A
Acetellic ® 5E Insecticide	57% Pirimiphos Methyl Solution	Seed and grain treatment to stored corn and sorghum	0.48 lbs. a.i. per 30 tons of grain [3] or 0.12 lbs. a.i. per 1,000 square feet of grain [3]	1	N/A
Execute S-P ™ 5E Insecticide	57% Pirimiphos Methyl Solution	Seed and grain treatment to stored corn and sorghum	0.22 lbs. a.i. per 28 tons of grain [4]	1	N/A
Agrisolutions Acetellic 5E Insecticide (Washington State)	57% Pirimiphos Methyl Solution	Indoor Fogger treatment for Iris	0.224 lb. a.i. per 1,000 cubic feet [5]	Not Specified	Not Specified
Acetellic 5E Insecticide (Michigan)	57% Pirimiphos Methyl Solution	Indoor Fogger, Drench, and Bulb Dip treatment for Gladiola Bulbs	0.043 lb per 1,000 cubic feet (fogger treatment) [6] Not Specified (Bulb dip and drench treatments)	Not Specified	Not Specified

[1] Calculated based on net weight of 9.6g of product and 20 percent a.i. formulation per tag and application of two tags per animal per label information and instructions.

[2] Calculated based on net weight of 9.5g of product and 14 percent a.i. formulation per tag and application of two tags per animal per label information and instructions.

[3] Calculated based on maximum application rate of 12.3 fl oz. of product per 30 tons of seed or 3.0 fl oz. of product per 1,000 sq. ft. of grain and formulation of 5 lbs. of pirimiphos methyl per product on label.

[4] Calculated based on maximum application rate of 5.6 fl oz. of product per 28 tons of seed and formulation of 5 lbs. of pirimiphos methyl per product on label.

[5] Calculated based on maximum application rate of 60 ml of product per 10 cubic meters of space and formulation of 5 lbs. of pirimiphos methyl per product on label.

[6] Calculated based on maximum application rate of 1.2 oz. of product per 1,000 cubic meters of space and 57 percent a.i. formulation on label.

Data specific to the nationwide usage of pirimiphos methyl is limited. However, **Figures 1 – 3** show the potential regions where pirimiphos methyl can be used on agricultural and livestock commodities (graphical data from the 2002 USDA Agricultural Census, <http://www.nass.usda.gov/research/atlas02/index.html>). Insect control on harvested corn grain would account for much of the pirimiphos methyl usage in the Midwestern states. Use on harvested sorghum grain would account for much of the pirimiphos methyl usage in the Southern High Plains, South-Central and North-Central Texas, and the Mississippi Delta region. Cattle tags containing pirimiphos methyl can be used throughout much of the country with the largest potential prevalence within Appalachian Valley agricultural areas, the Cumberland Plateau, Florida, Great Plains, Desert Southwest, and Pacific Northwest.

Figure 1. Harvested corn grain acreage by county/parish (USDA Agricultural Census, 2002).

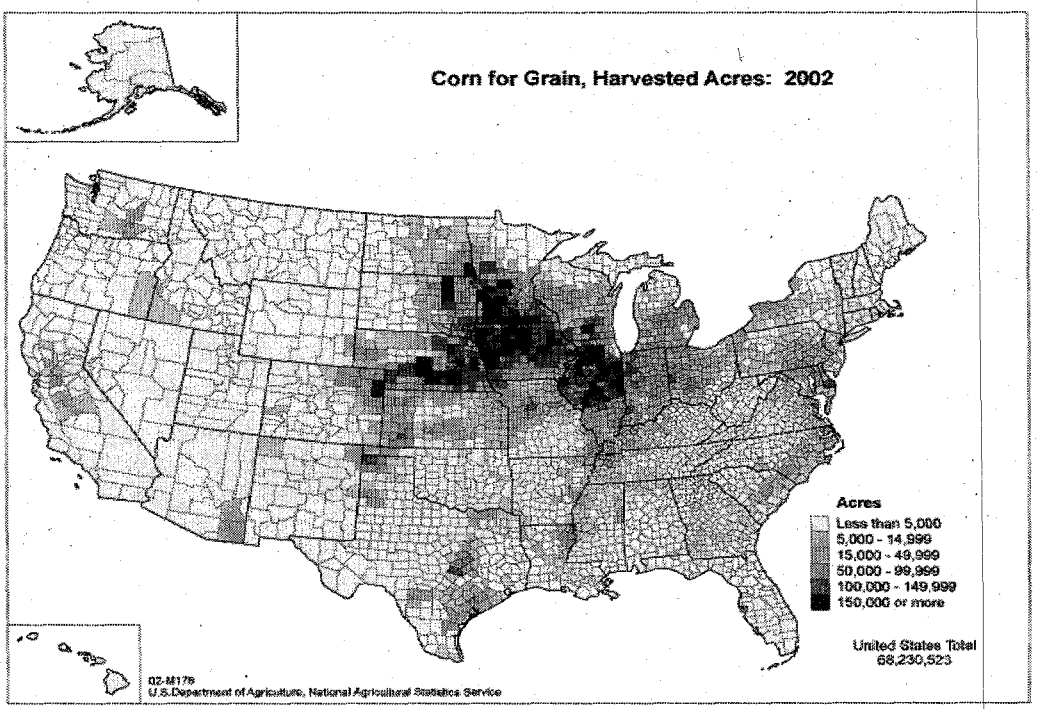


Figure 2. Harvested sorghum grain acreage by county/parish (USDA Agricultural Census, 2002).

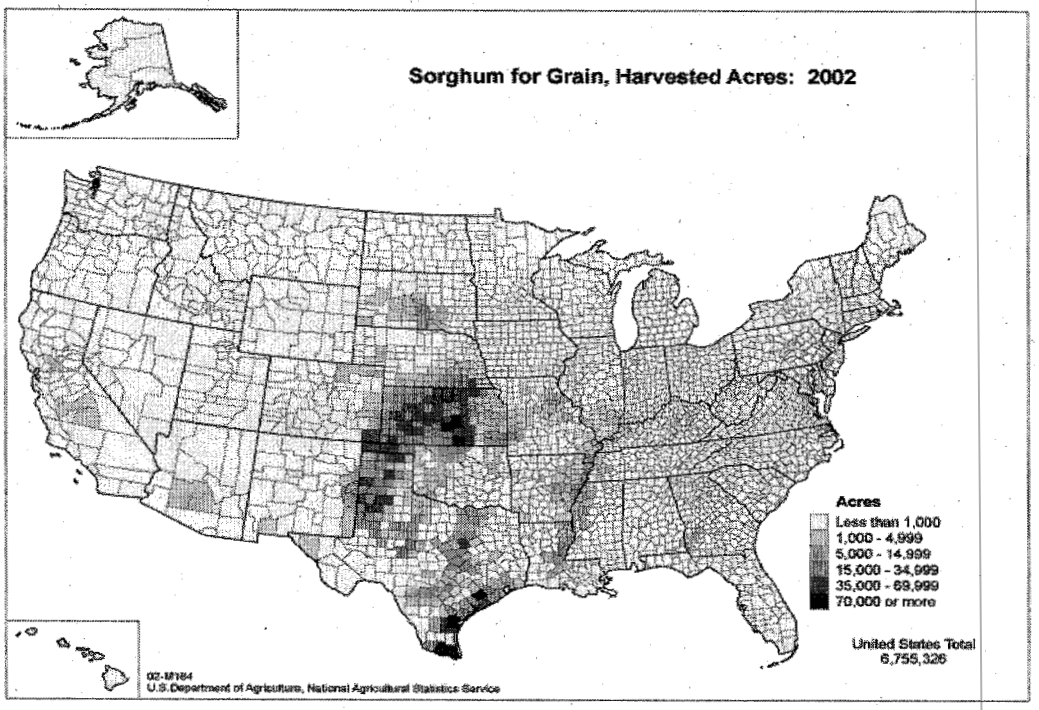
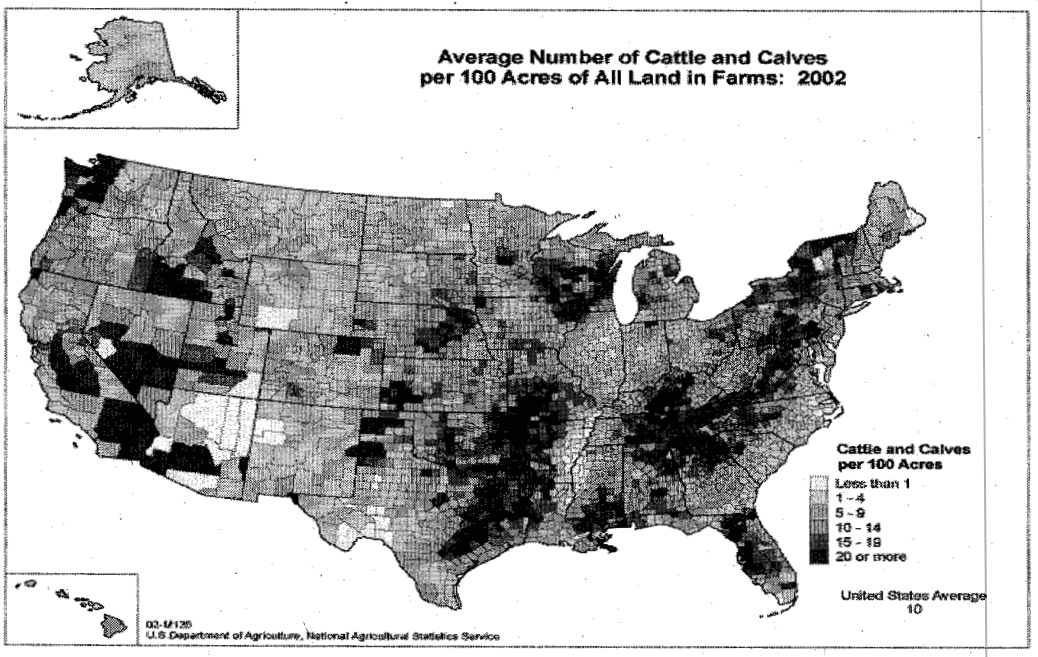


Figure 3. Cattle production population density by county/parish (USDA Agricultural Census, 2002).



3.3. Environmental Fate and Transport

Residues of pirimiphos methyl can be transported away from use sites in the environment, as corn and sorghum seeds can be planted after pirimiphos methyl treatment and storage. In addition, residues of pirimiphos methyl may directly settle or runoff into water bodies as a result of cattle ear tag uses. Registrant-submitted data defining the physical, chemical, fate and transport characteristics associated with pirimiphos methyl are summarized in **Table 2**. As part of registration review, available fate studies for pirimiphos methyl have been reevaluated. The fate and transport of pirimiphos methyl in the environment is discussed below.

Table 2. General chemical and environmental fate properties of pirimiphos methyl.

Chemical/Fate parameter	Value	Source (MRID)
Molecular Weight (g/mol)	305	Product Chemistry (MRID 00129333)
Vapor Pressure (torr at 30°C)	1.1×10^{-4}	Product Chemistry (MRID 00129333)
Octanol-water Partition Coefficient (Log K_{OW} at 20°C)	4.2	Product Chemistry (MRID 92147003)
Octanol-air Partition Coefficient (Log K_{OA})	8.743	EPI Suite (KOAWIN v. 1.1 estimate)
Water Solubility (mg/L; at 20°C)	9.9 mg/L at pH 5.2 8.6 mg/L at pH 7.3 9.3 mg/L at pH 9.3	Product Chemistry (MRID 92147003)
Henry's Law Constant (atm-m^3 mol^{-1})	5.105×10^{-6}	EPI Suite (HENRYWIN v. 3.10)
Hydrolysis half lives (days)	7.3 days at pH 5 79 days at pH 7 54 – 62 days at pH 9	MRID 42982401
Aqueous photolysis half-life (days at 20°C) [1]	0.2 days	Footprint Database
Photolysis in air half-life (hours at 25°C)	2.4 hours 0.802 hours	SRC Database EPI Suite (AopWIN v. 1.92)
Soil Photolysis half-life (days)	No Data Available	-
Aerobic Soil Metabolism half-life (days) [2]	128, 188.3, 100.8, and 219.8 days	MRID 135358
Anaerobic Soil Metabolism half-life (days) [2]	98.7 and 245 days	MRID 135358
Aerobic Aquatic Metabolism half-life (days)	No Data Available	-
Anaerobic Aquatic Metabolism half-life (days)	No Data Available	-

Chemical/Fate parameter	Value	Source (MRID)
Organic carbon normalized partition coefficients (K_{OC})	1,100 ml/g 4,600 ml/g 138.4 ml/g	Footprint Database SRC Database EPI Suite (PCKOCWIN v 1.66 estimate)

[1] Estimated based on DT-50 value.

[2] Preliminary estimate based on aerobic soil metabolism with application rate of 1 kg a.i./ha and dry anaerobic soil metabolism study with nitrogen atmosphere with application rate of 1 kg a.i./ha (MRID 135358).

3.3.1. Degradation

One major degradation pathway for pirimiphos methyl is hydrolysis, especially in acidic environments. Hydrolysis half-lives from laboratory studies ranged from 7.3 days at pH 5, to 79 days at pH 7 with a half-life of 54 – 62 days at pH 9. The major degradates were 2(diethylamino)-4-hydroxy-6-methyl pyrimidine (herein degradate no. 1), O-2 dethylamino-6-methylpyrimidin-4-yl o-methyl-phosphorothioate (herein degradate no. 2), and hydroxyl pyrimidine (IV) (herein degradate no. 3). In the pH 5 solution, degradate nos. 1 and 2 reached maximum levels of 85.03 – 90.46 percent 30 days posttreatment and 4.97 – 6.25 percent at 21 days posttreatment, respectively of the overall material balance. In the pH 7 solution, degradate nos. 1 and 2 reached maximum levels of 14.14 – 22.88 percent and 25.77 – 38.91 percent of the overall material balance at 90 days post-treatment, respectively. In the pH 9 solution, degradate no. 1 and 2 reached levels of 25.24 – 30.15 percent and 18.06 – 27.17 percent, respectively of the overall material balance. In another solution (pH range 6.5 – 7.3), degradate no. 3 reached levels approximately 75 percent by 6 days.

Aqueous photolysis is also expected to be a significant degradation process with an estimated DT-50 of 0.2 days for pirimiphos methyl. However, the determination of aqueous photolysis half-lives using Agency guideline study methods have not been submitted. Pirimiphos methyl is also not expected to persist in the air with a half-life range of between 0.802 – 2.4 hours.

Pirimiphos methyl is expected to biodegrade at slow rates. In soil, the preliminary determined aerobic soil metabolism half-lives ranged from 100.8 to 219.8 days (14.4 to 31.4 weeks) and preliminary determined anaerobic soil half lives ranged from 98.7 to 245 days (14.1 to 35 weeks). The major metabolite from aerobic and anaerobic soil metabolism is 2-diethylamono-6-methyl pyrimidin-4-ol, and the minor products included the polar product N,N, - diethylguanidine. However, the temporal formation and decline trends of the degradation products were not clear in the study (MRID 135358). No Agency guideline studies have been conducted to determine the biodegradation of pirimiphos methyl in water.

3.3.2. Transport and Dissipation

Agency guidelines studies regarding the mobility of pirimiphos methyl or its degradates in soil have not been submitted. The estimated soil-water partition coefficient

normalized to organic carbon (K_{oc}) are in the range of 138.4 ml/g to 4,600 ml/g suggesting that pirimiphos methyl may be slightly mobile to immobile. The combination of moderate to high K_{oc} values and the highly soluble nature of pirimiphos methyl in the range of 8.6 to 9.9 mg/l indicate that pirimiphos methyl residues can be transported offsite through runoff and leaching processes. There is no terrestrial field dissipation data available for pirimiphos methyl. Therefore, pirimiphos methyl residues in the soil column and in runoff are unknown under typical field conditions.

The vapor pressure of 1.1×10^{-4} torr suggests that pirimiphos methyl can exist as a gas and as an aerosol. Preliminary review of the aerobic and anaerobic metabolism studies (MRID 135538) reveal the possibility that pirimiphos methyl can partition to volatile traps as total system recoveries of pirimiphos methyl were as much as 72 percentage points different than extracted residues of pirimiphos methyl in the soil in an aerobic environment. In addition, pirimiphos methyl was detected in a few rain events (0.5 percent of total rain events) in concentrations up to 0.007 µg/l (Charizopoulos *et al.*, 1999). Although there is some indication for pirimiphos methyl residues to exist in air, the photolysis in air half life of between 0.802 and 2.4 hours suggests that the residence time of residues will be limited. Therefore, volatility is not a concern considering the low frequency and low detection levels of pirimiphos methyl and low residence time of pirimiphos methyl residues in the air.

3.3.3. Bioaccumulation

A log K_{ow} of 4.2 indicates that pirimiphos methyl is sufficiently hydrophobic for binding with fatty tissue for aquatic organisms as well as available sediment. Pirimiphos methyl residues may also potentially bioaccumulate in terrestrial organisms given the large log K_{oA} of 8.743. However, since pirimiphos methyl is highly soluble, it is anticipated that depuration rates will be high.

4. Receptors

The receptor is the biological entity that is exposed to the stressor (EPA, 1998). Consistent with the process described in the Overview Document (EPA, 2004), this risk assessment uses a surrogate species approach in its evaluation of pirimiphos methyl. Toxicological data generated from surrogate test species, which are intended to be representative of broad taxonomic groups, are used to extrapolate to potential effects on a variety of species (receptors) included under these taxonomic groupings.

From all the acceptable data, the most sensitive acute and chronic endpoints are incorporated into the risk assessment for a particular taxonomic group. In addition, studies from published scientific literature and reported ecological incidents involving the targeted chemical may be used as supplemental information for risk characterization. Sections 4.1-4.5 summarize the available aquatic and terrestrial toxicity data for pirimiphos methyl.

4.1. Effects to Terrestrial Organisms

Toxicity studies using the technical grade ingredient of pirimiphos methyl are required to determine the potential adverse effects for birds, mammals, terrestrial-phase amphibians, reptiles and invertebrates. Bird studies are also used as a surrogate for terrestrial-phase amphibians and reptiles, and bee studies are used to imply effects to terrestrial invertebrate taxa. Summarized terrestrial toxicity data from acceptable registrant-submitted studies are presented in Table 3. Pirimiphos methyl is considered practically non-toxic to mammals and highly toxic to avian species based on acute oral studies and highly toxic to terrestrial invertebrates on a contact toxicity basis.

Table 3. Most sensitive endpoints from terrestrial toxicity studies for pirimiphos methyl

Species (common name)	Taxa Represented	End-point	Exposure period	Dose or Concentration (a.i.)	Test Substance (% a.i.)	MRID (Citation)	Acute Toxicity Classification
Rattus norvegicus (Brown rat)	Mammals	LD_{50}	Single dose	2.4 g/kg-bw	75.4 (form)	00126257 (Kynoch & Ginty, 1981)	Practically non-toxic
Colinus virginianus (Northern bobwhite quail)	Birds, terrestrial-phase amphibians, and reptiles	LD_{50}	8 days	40 mg/kg-bw	88.9	43442101 (Campbell & Beavers, 1994)	Highly toxic
		NOEL	8 days	19.0 mg/kg-bw			
		LC_{50}	8 days	207 mg/kg-diet	99.5	00107423 (Fink, 1974)	
		NOEC	8 days	<21.0 mg/kg-diet			
Apis mellifera (Honey bee)	Terrestrial invertebrates	LD_{50} (contact)	48 hours	0.29 µg/bee	Technical	05001991 (Stevenson, 1978)	Highly toxic

4.2. Effects to Aquatic Organisms

Toxicity studies using the technical grade ingredient of pirimiphos methyl are required to determine the potential adverse effects for freshwater fish, aquatic-phase amphibians and invertebrates. Freshwater fish studies are also used as a surrogate for aquatic-phase amphibians. Summaries of the aquatic toxicity data from acceptable registrant-submitted studies are provided in Table 4. Pirimiphos methyl is considered highly toxic to freshwater fish and very highly toxic to aquatic invertebrates on an acute toxicity basis.

Table 4. Most sensitive endpoints from aquatic toxicity studies for pirimiphos methyl (technical).						
Species (common name)	**Taxa Represented**	**End-point**	**Duration (hours)**	**Concentration (a.i.)**	**MRID (Citation)**	**Acute Toxicity Classification**
Oncorhynchus mykiss (Rainbow trout)	Freshwater fish and aquatic-phase amphibians	LC_{50}	96	0.404 ppm	00103924 (Hill, 1978)	Highly toxic
		NOAEC	96	0.180 ppm		
Daphnia magna (Water flea)	Freshwater Invertebrates	EC_{50}	48	0.11 ppb	00103926 (Evered & Doma, 1976)	Very highly toxic
		NOAEC	48	Not reported		

4.3 Effects to Nontarget Plants

No studies examining the effects of pirimiphos methyl to nontarget plant species have been submitted to the Agency by the registrant. The latest risk European Food Safety Authority risk assessment for pirimiphos methyl indicated toxicity to algal species (*Pseudokirchneriella subcapitata*) with a 72-hour EC_{50} value of 1.2 ppm on an active ingredient basis (EFSA, 2005). Additionally, information from Syngenta indicates that a pirimiphos methyl formulated product (Actellic 50EC, United Kingdom) is toxic to *Pseudokirchneriella subcapitata* at a 4 ppm to 22 ppm range. The highest preliminary EEC is 0.8334 ppb from pirimiphos methyl cattle ear tags (Table B-3), assuming 20 percent of maximum pirimiphos methyl residues from the cattle hide wash off into a water body. Based on the suggested range of toxicity to aquatic plants and the low estimated aquatic exposure concentrations, pirimiphos methyl is not expected to present a risk concern to aquatic plant species with the current labeled uses.

4.4. Incident Database Review

No incidents involving wildlife injuries associated with uses of pirimiphos methyl were documented in the Ecological Incident Information System (EIIS) database. This database consists of ecological incidents involving pesticides submitted to the EPA from 1994 to present. The number of reports listed in the EIIS database is believed to be only a small fraction of the total incidents involving mortality and other damage to non-target plants and animals from pesticide use. Few resources are allocated to incident reporting. Reporting by states is only voluntary, and individuals discovering incidents may not be informed on the procedure of reporting these occurrences. Additionally, much of the database is generated from registrant-submitted incident reports. Registrants are legally required to provide detailed reports of only "major" ecological incidents involving pesticides, while "minor" incidents are reported aggregately. Because of these organizational difficulties, EIIS is most likely a minimal representation of all pesticide-related ecological incidents.

4.5. Ecosystems Potentially at Risk

The ecosystems at risk are often extensive in scope and therefore it may not be possible to identify specific ecosystems during the development of a nation-wide ecological risk assessment. In general, terrestrial ecosystems potentially at risk include the field containing treated seeds. Avian species entering the field could be exposed to pirimiphos methyl residues via ingestion of the treated seeds. In addition, runoff from cattle ear tag treatments could result in exposure to aquatic habitats. Preliminary calculations indicate that peak concentrations from cattle tag runoff may affect aquatic invertebrate populations. The highest preliminary aquatic EEC are 0.8334 ppb, assuming 20 percent of maximum pirimiphos methyl residues from treated cattle wash into a water body (Table B-3). The submitted freshwater invertebrate acute toxicity study for pirimiphos methyl shows a 48-hour EC_{50} of 0.11 ppb (MRID 00103926, Table 4). Fish species show lower sensitivity when compared with invertebrate acute toxicity values, and the estimated exposure concentrations of pirimiphos methyl are not expected to exist at levels that would significantly affect fish. The most sensitive submitted acute toxicity study for fish reported an LC_{50} of 0.404 ppm and a NOAEC of 0.18 ppm (MRID 00103924, Table 4). Exposure to aquatic plants is also a potential source for ecological risk, but adverse effects are only seen at much higher levels than the predicted exposure concentrations. Because effects to algal species (based on EC_{50} values) are seen at 1.2 ppm or higher (Section 4.3), pirimiphos methyl is not expected to present a risk concern to aquatic plant species with the current labeled uses.

5. Assessment Endpoints

Assessment endpoints represent the actual environmental value that is to be protected, defined by an ecological entity (species, community, or other entity) and its attribute or characteristics (US EPA 2000). For pirimiphos methyl, the ecological entities may include the following: birds, terrestrial-phase amphibians, reptiles, terrestrial invertebrates, freshwater fish and invertebrates, aquatic-phase amphibians, estuarine/marine fish and invertebrates, and aquatic plants. The affected attributes for each of these entities may include growth, reproduction, and survival.

6. Conceptual Model

For a pesticide to pose an ecological risk, it must reach ecological receptors in biologically significant concentrations. An exposure pathway is the means by which a pesticide moves in the environment from a source to an ecological receptor. For an ecological pathway to be complete, it must have a source, a release mechanism, an environmental transport medium, a point of exposure for ecological receptors, and a feasible route of exposure.

The conceptual model for pirimiphos methyl provides a written description and visual representation of the predicted relationships between pirimiphos methyl, potential routes of exposure, and the predicted effects for the assessment endpoint. A conceptual model

consists of two major components: risk hypothesis and a conceptual diagram (US EPA, 1998).

6.1. Risk Hypothesis

A risk hypothesis describes the predicted relationship among the stressor, exposure, and assessment endpoint response along with the rationale for their selection. For pirimiphos methyl, the following ecological risk hypothesis is being employed for this ecological risk assessment:

> *Based on the application methods, mode of action, fate and transport, and the sensitivity of non-target terrestrial and aquatic species, pirimiphos methyl has the potential to reduce survival, reproduction, and/or growth in non-target avian species and aquatic invertebrates when used in accordance with the current label. These non-target organisms include Federally listed threatened and endangered species as well as non-listed species.*

6.2. Conceptual Diagram

Pirimiphos methyl can impact aquatic organisms through uptake after off-site movement from the labeled cattle ear tag use (see Attachment C). In addition, birds could be impacted through dietary routes from seed treatment residues. There is no ecological risk associated with the indoor fogger treatment to iris included in the Washington State Section 24(c) label and the indoor fogger, dip, and drench treatments to gladiola bulbs in the Michigan Section 24(c) label. Figures 4 and 5 are conceptual models showing the potential receptors of concern and the potential attribute changes in the receptors due to exposures of pirimiphos methyl.

Figure 4. Conceptual model for pirimiphos methyl effects on aquatic organisms. Dotted lines indicate exposure pathways that have a low likelihood of contributing to ecological risk.

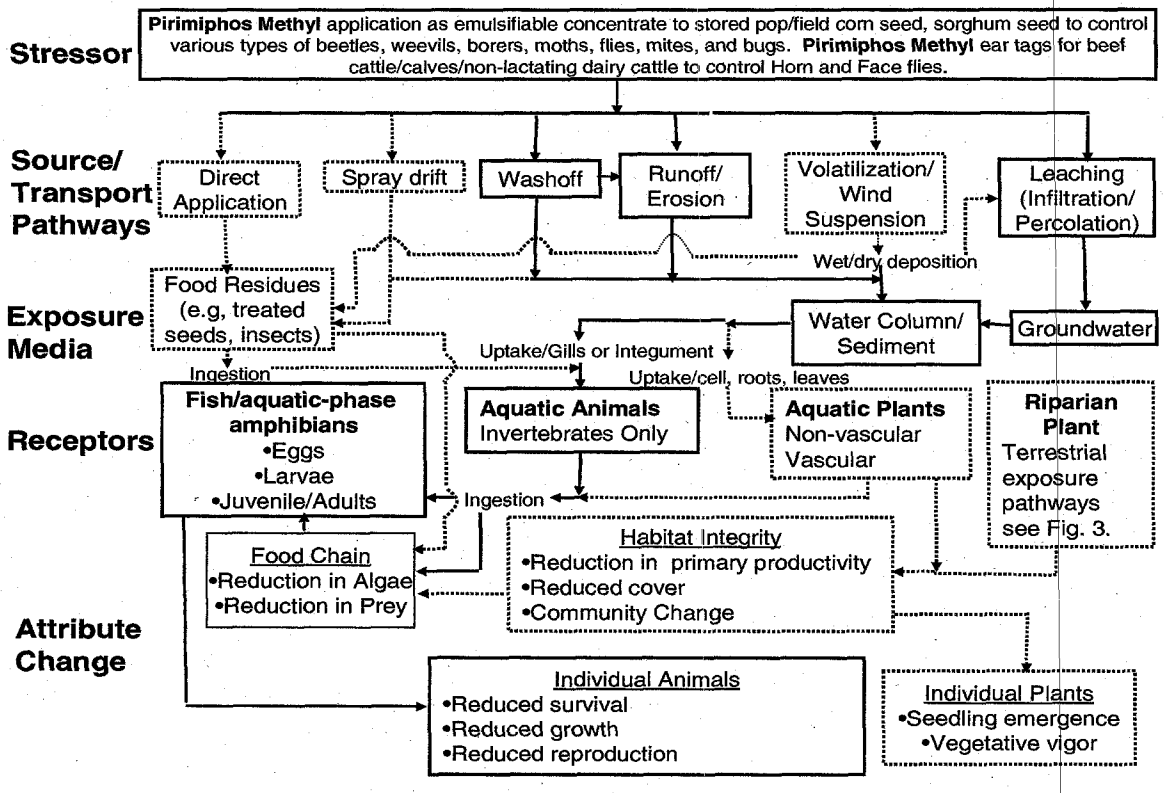
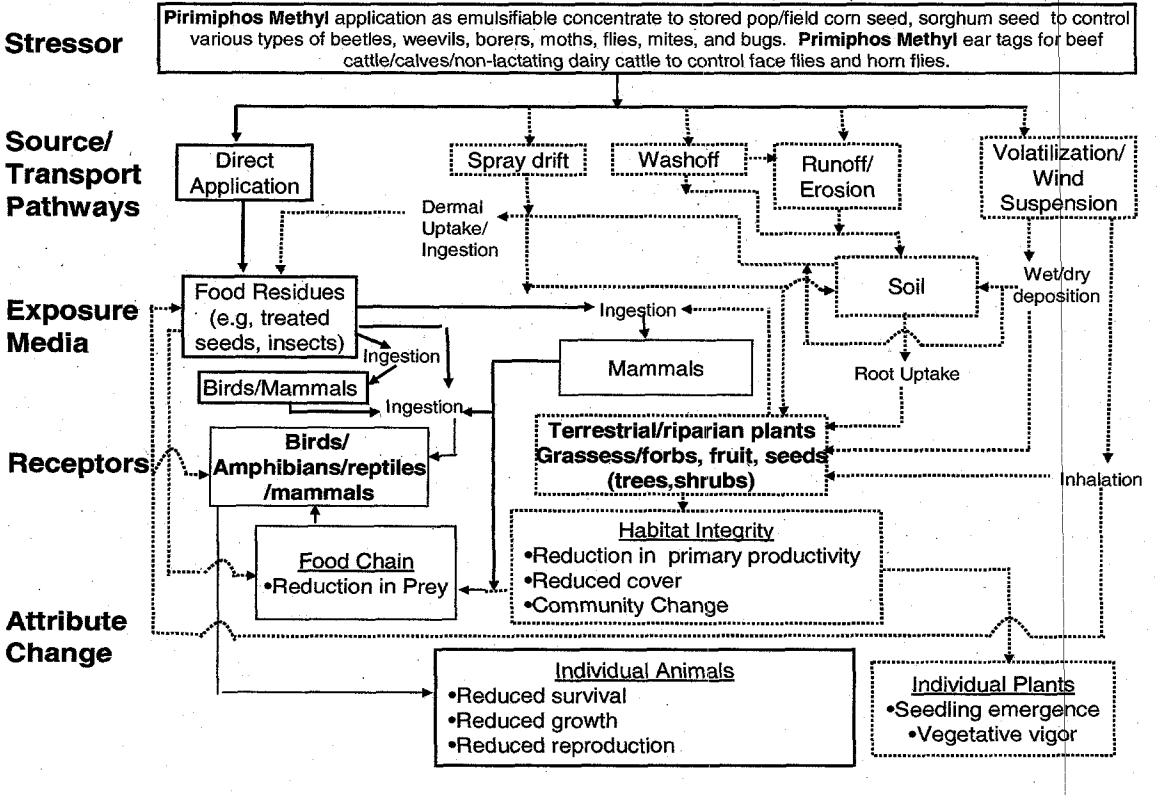


Figure 5. Conceptual model for pirimiphos methyl effects on terrestrial organisms.



7. Analysis Plan

In order to address the risk hypothesis, the potential for adverse effects on the environment is estimated. The use, environmental fate, and ecological effects of pirimiphos methyl are characterized and integrated to assess the risks. This is accomplished using a risk quotient (ratio of exposure concentration to effects concentration) approach. Although risk is often defined as the likelihood and magnitude of adverse ecological effects, the risk quotient-based approach does not provide a quantitative estimate of likelihood and/or magnitude of an adverse effect. However, as outlined in the Overview Document (USEPA 2004), the likelihood of effects to individual organisms from particular uses of pirimiphos methyl is estimated using the probit dose-response slope and either the level of concern (discussed below) or the actual calculated risk quotient value.

This analysis plan will be revisited and may be revised depending upon the data available in the open literature and the information submitted by the public in response to the opening of the Registration Review docket.

7.1. Stressors of Concern

Based on available aerobic soil metabolism and hydrolysis data, pirimiphos methyl is expected to be the dominant stressor to be present in the environment. Therefore, the focus of this assessment is expected to be the parent compound, pirimiphos methyl. However, the formation of major degradates 2(diethylamino)-4-hydroxy-6-methyl pyrimidine, O-2 dethylamino-6-methylpyrimidin-4-yl o-methyl-phosphorothioate, and hydroxyl pyrimidine (IV) on treated corn and sorghum seeds will also be considered.

7.2. Measures of Exposure

Pirimiphos methyl potential exposure in the aquatic and terrestrial environments will be assessed for the cattle tag and pre-plant stored corn and sorghum seed treatment uses described in Section 3. For the cattle ear tag uses, measures of exposure will be calculations assuming direct applications to water considering living habits of cattle livestock. For the pre-plant stored corn and sorghum seed pirimiphos methyl treatments, measures of exposure will be based on aquatic models that predict estimated environmental concentrations of pirimiphos methyl using maximum labeled application rates and methods. The methods used for the calculation of EECs for each use pattern are outlined in Sections 7.2.1 and 7.2.2.

Monitoring data, where available, will also be utilized to determine pirimiphos methyl background concentrations as well as to validate upper-bound concentrations from events leading to the contamination of surface water and ground water.

7.2.1 EECs from Pre-Plant Stored Seed Treatment

The aquatic exposure assessment for the corn and sorghum seed treatment uses will utilize the Pesticide Root Zone Model coupled with the Exposure Analysis Model System (PRZM/EXAMS) to arrive at predicted EECs. Dietary exposure estimates for terrestrial animals exposed to treated seeds with pirimiphos methyl residues are derived using the T-REX model.

PRZM (v3.12.2, May 2005) and EXAMS (v2.98.4.6, April 2005) are screening simulation models coupled together with the input shell pe5.pl (Aug 2007) to generate daily exposures and 1-in-10 year EECs of pirimiphos methyl that may occur in surface water and benthic water pore concentrations in water bodies adjacent to application sites receiving pirimiphos methyl through runoff. PRZM simulates pesticide application, movement and transformation on an agricultural field and the resultant pesticide loadings to a receiving water body (e.g., the Georgia farm pond scenario) via runoff and erosion. EXAMS simulates the fate of the pesticide and resulting concentrations in surface water and benthic pore water concentrations considering the mass transfer between the sediment and water compartments. The standard scenario used for ecological pesticide assessments assumes application to a 10-hectare agricultural field that drains into an adjacent 1-hectare water body that is 2 meters deep (20,000 m^3 volume) with no outlet. PRZM/EXAMS is used to estimate screening-level exposure of aquatic organisms to pirimiphos methyl for corn and sorghum pre-plant stored seed treatment uses. The measure of exposure for aquatic species is the 1-in-10 year return peak or rolling mean concentration. The 1-in-10 year peak is used for estimating acute exposures of direct effects to aquatic organisms. The 1-in-10-year 60-day mean is used for assessing chronic exposure to fish and aquatic-phase amphibians. The 1-in-10-year 21-day mean is used for assessing aquatic invertebrate chronic exposure.

Preliminary aquatic EECs for the corn and sorghum seed treatment uses is presented herein (see Attachment 1). PE5 runs using the Georgia Farm Pond scenario do not indicate a concern for exposure to aquatic organisms in surface water with acute pirimiphos methyl EECs $\leq$ 0.0018 ppb and chronic pirimiphos methyl EECs $\leq$ 0.0007 ppb. These EECs are well below the most sensitive effects levels of 0.11 ppb (*daphnia magna* EC_{50}) available. Despite pirimiphos methyl's potential for off-site movement, the most likely reason for low EECs is the very low application rate on treated seed. Please note that these results are conservative since initial loading subject to the environment was based on a standard seed treatment use whereby storage time nor bound residues on treated seeds were taken into account.

The TREX model (version 1.3.1, 12/07/2006) incorporates the Kenega nomograph, as modified by Fletcher *et al.* (1994), which is based on a large set of actual field residue data. The upper limit values from the nomograph represent the 95th percentile of residue values from actual field measurements (Hoerger and Kenega, 1972). The Fletcher *et al.* (1994) modifications to the Kenega nomograph are based on measured field residues from 249 published research papers, including information on 118 species of plants, 121 pesticides, and 17 chemical classes.

7.2.2 EECs from Cattle Ear Tags

There are three possible scenarios whereby pirimiphos methyl residues can enter the aquatic ecosystem. First, ear tags with pirimiphos residues can fall off cattle into water bodies. Second, multiple cattle that are treated with pirimiphos methyl can directly enter a water body. Third, rainfall can cause washoff of pirimiphos residues to be transported from treated multiple cattle to water bodies via runoff. For each of these cases, surface water concentrations will be calculated using the maximum mass of pirimiphos methyl per animal, 3.84 g from the Dominator® Insecticide table spilling into a standard farm pond of 1 ha area and 2 m depth or a volume of 2.0×10^7 L. Surface water EECs will be calculated utilizing the KdCalc program which considers the soil-water partition coefficient and the depth of the sediment layer (Parker, 2002).

Preliminary aquatic EECs for the cattle ear tag uses is presented herein (see Attachment 2). Pirimphos methyl acute EECs of up to 0.8334 ppb in surface water and pirimiphos methyl chronic EECs of up to 0.004 ppb in surface water were calculated for the runoff scenario from a feedlot with 1,000 treated cattle The EEC calculated assumes a scenario wherby 20 percent of pirimiphos methyl residues washed off of cattle hide directly into a pond. The maximum acute EEC exceeds the toxicological threshold for the *Daphnia magna* EC_{50} of 0.11 ppb. This is the case for only the runoff scenario from a feedlot with treated cattle. This is a well known and highly documented problem (Kizil and Lindley, 2002). Another calculated EEC of 0.208 ppb indicates that less than five percent of pirimiphos methyl may washoff from each cow on a feedlot with a population of 1,000 cattle head for adverse effects to the most sensitive species to remain possible. Additionally, repeated exposure is also a concern for aquatic organisms since multiple rain events can cause higher environmental loadings of pirimiphos methyl as additional residues can washoff cattle hide.

7.3. Measures of Effect

Ecological effects data are used as measures of direct and indirect impacts to biological receptors. Data are obtained from registrant-submitted studies or from literature studies identified by the ECOTOX database (US EPA, 2007). The acute measures of effect used for animals in this assessment are the LD_{50}, LC_{50} and EC_{50}. LD stands for "Lethal Dose", and LD_{50} is the amount of a material (given at one time) that is estimated to cause the death of 50% of the test organisms. LC stands for "Lethal Concentration" and LC_{50} is the concentration of a chemical that is estimated to kill 50% of the test organisms. EC stands for "Effective Concentration" and the EC_{50} is the concentration of a chemical that is estimated to produce a specific effect in 50% of the test organisms. Endpoints for chronic measures of exposure for listed and non-listed animals are the NOAEL or NOAEC. NOAEL stands for No Observed Adverse Effect Level and refers to the highest tested dose of a substance that shows no harmful effects on test organisms. The NOAEC, or No Observed Adverse Effect Concentration, is the highest test concentration at which none of the observed effects were statistically different from the control. For non-listed

plants, only acute exposures are assessed (*i.e.*, EC_{25} for terrestrial plants and EC_{50} for aquatic plants), and for listed plants either the NOAEC or EC_{05} is used.)

7.4. Integration of Exposure and Effects

Risk characterization is the integration of exposure and ecological effects characterization to determine the potential ecological risk from the uses of pirimiphos methyl and the likelihood of direct and indirect effects to non-target organisms in aquatic and terrestrial habitats. The exposure and toxicity effects data are integrated in order to evaluate the risks of adverse ecological effects on non-target species. For the assessment of pirimiphos methyl risks, the risk quotient (RQ) method is used to compare exposure and measured toxicity values. EECs are divided by acute and chronic toxicity values. The resulting RQs are then compared to the Agency's Levels of Concern (LOCs) (USEPA 2004). These criteria are used to indicate when the use of pirimiphos methyl, as directed on the label, has the potential to cause adverse direct or indirect effects to non-target organisms.

7.5. Deterministic and Probabilistic Assessment Methods

The quantitative assessment of risk will primarily depend on the deterministic point-estimate based approach described in the risk assessment. An effort will be made to further qualitatively describe risk using probabilistic tools that the Agency has developed. These tools have been reviewed by FIFRA Scientific Advisory Panels (http://www.epa.gov/scipoly/sap/index.htm) and have been deemed as appropriate means of refining assessments where deterministic approaches have identified risks.

7.6. Endangered Species Assessments

Consistent with the Agency's responsibility under the Endangered Species Act (ESA), the Agency will evaluate risks to Federally-listed threatened and/or endangered species from registered uses of pirimiphos methyl. This assessment will be conducted in accordance with the Overview Document (US EPA, 2004), provisions of the ESA, and the US Fish & Wildlife Services' *Endangered Species Consultation Handbook* (US FWS/NMFS, 1998).

The assessment of effects associated with the registration of pirimiphos methyl is based on an action area. The action area is considered to be the area directly or indirectly affected by the federal action, as indicated by the exceedance of Agency Levels of Concern (LOC). The Agency's approach to defining the action area under the provisions of the Overview Document (US EPA, 2004) considers the results of the risk assessment process to establish boundaries for that action area with the understanding that exposures below the Agency's defined LOCs constitute a no-effect threshold. For the purposes of this assessment, attention will be focused on the footprint of the action (i.e., the area where pirimiphos methyl application occurs), plus all areas where offsite transport (i.e., runoff, etc.) may result in potential exposure that exceeds the Agency's LOCs. Specific measures of ecological effects that define the action area for listed species include any

direct and indirect effects and/or potential modification of its critical habitat, including reduction in survival, growth, and reproduction, as well as any other sublethal effects. Therefore, the action area extends to the point where environmental exposures are below any measured lethal or sublethal effect threshold for any biological entity at the whole organism, organ, tissue, and cellular level of organization. In situations where it is not possible to determine the threshold for an observed effect, the action area is not spatially limited and is assumed to be the entire United States.

7.7. Drinking Water Assessment

A drinking water assessment will be conducted to support future human health risk assessments of pirimiphos methyl as needed. The drinking water assessment will present estimated concentrations of pirimiphos methyl residues in surface and ground waters. Acute, chronic, and cancer (peak, annual mean, and 30-year means) estimated surface water concentrations will be calculated using modeling tools such as the PRZM/EXAMS model using the index reservoir scenario incorporating intakes into water bodies. Ground water estimated concentrations of pirimiphos methyl will be estimated using the Screening Concentration in Ground Water (SCI-GROW) model (v.2.3, July 2003).

7.8. Preliminary Identification of Data Gaps

7.8.1. Fate

At this time, the following studies are being requested regarding the fate of pirimiphos methyl:

- Leaching and absorption/desorption (Batch Equilibrium) (835.1230)

Table 5. Available environmental fate data for pirimiphos methyl and remaining data gaps.

Guideline	Description	MRID	Classification	Data Gap?
835.2120	Hydrolysis	42982401	Acceptable	No
		43177601	Acceptable	
		135356	In review	
835.2240	Photodegradation in water	N/A	N/A	No
835.2410	Photodegradation in soil	N/A	N/A	No
835.2370	Photodegradation in air	N/A	N/A	No
835.4100	Aerobic soil metabolism	135358	In review	No
835.4200	Anaerobic soil metabolism	135358	In review	No
835.4300	Aerobic Aquatic Metabolism	N/A	N/A	No
835.4400	Anaerobic Aquatic Metabolism	N/A	N/A	No
835.1230	Leaching and adsorption/ desorption	N/A	N/A	**Yes**
835.8100	Field Volatility	N/A	N/A	No
835.6100	Terrestrial Field Dissipation	N/A	N/A	No

Guideline	Description	MRID	Classification	Data Gap?
850.1710 850.1730 850.1850	Aquatic organisms – bioavailability, biomagnification, toxicity	N/A	N/A	No

[1] N/A means not applicable.

Leaching, adsorption, and desorption

A batch equilibrium study is requested at this time to address the potential for pirimiphos methyl residues to reach nearby water bodies associated with cattle ear tag uses. Preliminary acute aquatic EECs of 0.8334 ppb from pirimiphos methyl washing off into a water body from the hide of treated cattle with ear tags indicates an exposure level of concern to aquatic invertebrates. The soil-water partition coefficient is a vital parameter the calculation in the EECs since mass transfer between the sediment and water layer is taken into account. A guideline study (835.1230) is being requested considering the large range of Koc values obtained from various databases (138.4 ml/g to 4,600 ml/g – see Table 2). The calculated soil-water partition coefficient will be used to further refine the acute and chronic pond EEC for the cattle ear tag uses.

7.8.2. Effects

Although several submissions have been made to provide data on the effects of pirimiphos methyl to aquatic and terrestrial organisms, several data gaps still exist (**Tables 6 – 8**). Data gaps include avian reproduction and freshwater invertebrate life cycle studies. The data gaps are discussed below.

Table 6. Available ecological effects data for terrestrial animals exposed to pirimiphos methyl.

Guideline	Description	MRID/ Accession	Classification	Data Gap?
850.2100	Avian oral toxicity	43442101	Acceptable	No[1]
850.2200	Avian dietary toxicity	00107423	Acceptable	No
		00107422	Acceptable	
850.2300	Avian reproduction	None	Study requested	**Yes**[2]
850.3020	Honeybee acute contact toxicity	05001991	Acceptable	No

[1]Under the 2007 Part 158 Data Requirements, avian toxicity studies on a passerine species and either one waterfowl or upland gamebird species are now required. However, acute data have been submitted for an upland gamebird species, and the high acute toxicity of pirimiphos methyl to avian species has been established. Therefore, a passerine study is not being requested at this time, but interspecies variability is still an uncertainty in the assessment.

[2] Data are required on waterfowl and upland game bird species.

Table 7. Available ecological effects data for aquatic animals exposed to pirimiphos methyl.

Guideline	Description	MRID/ Accession	Classification	Data Gap?
850.1075	Freshwater fish – Acute toxicity	00103924	Acceptable	No
		00103925	Acceptable	
		00108078	Acceptable	
850.1075	Saltwater fish – Acute toxicity	None	Not applicable	No
850.1400	Freshwater fish – early life stage test	None	Not applicable	No[1]
850.1400	Saltwater fish – early life stage test	None	Not applicable	No
850.1500	Fish – life cycle test	None	Not applicable	No[1]
850.1010	Freshwater invertebrates – Acute toxicity	00103926	Acceptable	No
		00103926	Supplemental	
850.1025 850.1035 850.1045 850.1055	Saltwater invertebrates – Acute toxicity	None	Not applicable	No
850.1300	Freshwater invertebrate – life cycle test	None	Study requested	**Yes[2]**
850.1350	Saltwater invertebrates – life cycle test	None	Not applicable	No

[1]Data are not required at this time due to low estimated exposure concentrations relative to freshwater fish toxicity. The highest preliminary EEC is 0.8334 ppb, assuming washoff of 20 percent of maximum pirimiphos methyl residues from the cattle ear tags into a water body. (Table B-3). The most sensitive submitted acute toxicity study for fish reported an LC_{50} of 0.404 ppm and a NOAEC of 0.180 ppm (MRID 00103924, Table 4). Therefore, pirimiphos methyl is not expected to present a risk concern to fish species with the current labeled uses.

[2]Data required for one freshwater invertebrate species.

Table 8. Available ecological effects data for plants exposed to pirimiphos methyl.

Guideline	Description	MRID	Classification	Data Gap?
850.4100	Terrestrial Plant toxicity: Tier I seedling emergence	None	Not applicable	No
850.4225	Terrestrial Plant toxicity: Tier II seedling emergence	None	Not applicable	No
850.4150	Terrestrial Plant toxicity: Tier I vegetative vigor	None	Not applicable	No
850.4150	Terrestrial Plant toxicity: Tier II vegetative vigor	None	Not applicable	No
850.4400 850.5400	Aquatic Plant Growth: Tier I	None	Study requested	**No**[1]

[1]Due to low estimated exposure concentrations, aquatic plant growth studies are not requested at this time. The highest preliminary EEC is 0.8334 ppb, assuming 20 percent washoff of maximum pirimiphos methyl residues from the cattle ear tags into a water body. (Table B-3). Suggested EC_{50} values for algal species are 1.2 ppm or higher based on information from EFSA and Syngenta (Section 4.3), therefore pirimiphos methyl is not expected to present a risk concern to aquatic plant species with the current labeled uses.

Data Gaps

Avian Reproduction

An avian reproduction study has not yet been submitted by the registrant (OPPTS Guideline 850.2300) (Table 6). Data are required on waterfowl and upland game bird species. Stored grain treated with pirimiphos methyl can be planted the following season and terrestrial exposure to pirimiphos methyl residues can occur when birds ingest treated seeds. Because exposure routes from pirimiphos methyl-treated seeds exist for avian species via ingestion, risks may occur for non-listed and listed birds. In addition, there is capacity for continued exposure to birds during the breeding season.

Previously submitted studies show that pirimiphos methyl is highly toxic to bird species on an acute basis (MRID 43442101) and a subacute dietary basis (MRID 00107423) (Section 4.2). While the potential for acute and subacute risk has been demonstrated, these data alone are insufficient to describe lethal and sublethal effects to birds under continued or repeated exposure. If an avian reproduction study is not submitted, EFED will assume chronic risk for avian species.

Aquatic invertebrate life cycle (freshwater)

Chronic toxicity data are not available for aquatic invertebrates (OPPTS Guideline 850.1300) (Table 7). Potential risks to endangered and non-listed freshwater aquatic invertebrates exist due to washoff exposure from pirimiphos methyl cattle ear tags (Table B-3). EECs are as high as 0.8334 ppb, assuming 20 percent of maximum pirimiphos methyl residues from the hide of treated cattle wash into a water body. In addition, multiple rain events may cause repeat exposure instances. Previously submitted studies show that pirimiphos methyl is very highly toxic to freshwater aquatic invertebrates on an acute basis (MRID 00103926). While the potential for acute risk has been demonstrated,

these data alone are insufficient to describe lethal and sublethal effects to invertebrates under continued or repeated exposure. If an aquatic invertebrate life cycle study is not submitted, EFED will assume chronic risk for freshwater aquatic invertebrate species.

8. References

CFR 40. 2007. Code of Federal Regulations 40 Parts 150 to 189. Protection of the Environment. U.S. Government Printing Office.

Charizopoulos E. and Papadopoulou-Mourkidou, E. 1999. Environ Sci. Technol., 33: 2363-2368.

Close M.E. 1999. New Zealand J Marine Freshwater Res., 27: 267-273.

Cremlyn, R.J. 1991. Agrochemicals: Preparation and Mode of Action. p. 121 - 124. John Wiley and Sons. New York, NY.

European Food Safety Authority. 2005. Conclusion regarding the peer review of the pesticide risk assessment of the active substance pirimiphos-methyl. 44, 1-53. Available online at http://www.efsa.europa.eu/cs/BlobServer/PRAPER_Conclusion/praper_concl_sr44_pirimiphos-methyl_en1.pdf?ssbinary=true Accessed February 10, 2009.

Fletcher, J.S., J.E. Nellessen, and T.G. Pfleeger. 1994. Literature review and evaluation of the EPA food-chain (Kenaga) nomogram, an instrument for estimating pesticide residues on plants. Environ. Tox. Chem. 13:1383-1391.

Hoerger, F. and E. E. Kenaga, 1972. Pesticide Residues on Plants: Correlation of Representative Data as a Basis for Estimation of their Magnitude in the Environment. In F. Coulston and F. Korte, eds., *Environmental Quality and Safety: Chemistry, Toxicology, and Technology,* Georg Thieme Publ., Stuttgart, West Germany, pp. 9-28.

Kizil, U. and Lindley J., 2002. Feedlot Runoff and Manure Management Modeling. United States Department of Agriculture State Water Resources Research Institute, 2002 State Water Projects. Available online at http://water.usgs.gov/wrri/02grants/prog-compl-reports/2002ND7B.pdf. Accessed January 2009.

Mayer, F.; Ellersieck, M. 1986. *Manual of Acute Toxicity: Interpretation and Data Base 410 Chemicals and 66 Species of Fresh-Water Animals.* US Fish & Wildlife Service; Resource Publication (160): 579 p.

Parker, R. 2002. KDCalc Verison 1.0. USEPA Office of Pesticide Programs, Washington, DC.

Syngenta. Actellic 50EC Environmental Information. Cambridge, UK. Available online at http://www.syngenta-crop.co.uk/pdfs/products/Actellic50EC_uk_environmental_information.pdf. Accessed February 2009.

Syngenta. Actellic 50EC Safety Data. Cambridge, UK. Available online at http://www.syngenta-crop.co.uk/pdfs/products/Actellic50EC_uk_safety_data.pdf. Accessed February 2009.

U.S.Department of Agriculture (USDA). 2002. National Agricultural Census. United States Department of Agriculture. Available online at: http://www.nass.usda.gov/research/atlas02/index.html. Accessed January 2009.

U.S.Department of Agriculture (USDA), Economic Research Service Briefing Romm.. United States Department of Agriculture. Available online at: http://www.ars.usda.gov/IS/pr/2005/051216.htm. Accessed January 2009.

U.S. Environmental Protection Agency (USEPA). 1998. Guidelines for Ecological Risk Assessment. Risk Assessment Forum, Office of Research and Development, Washington, D.C. EPA/630/R-95/002F. April 1998. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=30759. Accessed January 2009.

USEPA. 2002. Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides, Version II. US Environmental Protection Agency, Washington DC. Online at: http://www.epa.gov/oppefed1/models water/input_guidance2_28_02.htm. Accessed January 2009.

USEPA. 2004. Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs. U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, Washington DC. January 23, 2004.

USEPA. 2006. Reregistration Eligibility Decision (IRED): Pirimiphos Methyl. U.S. Environmental Protection Agency, Office of Pesticide Programs, Washington, DC. July, 2006.

USEPA. 2007a. Ecological Incident Information System. http://www.epa.gov/espp/consultation/ecorisk-overview.pdf. Accessed January 2009.

USEPA. 2007b. 40 CFR Part 158. Pesticides; Data Requirements for Conventional Chemicals: Final Rule. 72 FR 60934. October 26, 2007.

USEPA. 2007c. ECOTOXicology Database. Office of Research and Development National Health and Environmental Effects Research Laboratory's (NHEERL's) Mid-Continent Ecology Division (MED). http://cfpub.epa.gov/ecotox/. Accessed January 2009.

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). 1998. Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. Final Draft. March 1998.

SUBMITTED FATE STUDIES:

MRID

135358 Arnold, D.; Hill, I.; Harvey, B.; et al. (1976) Pirimiphos-methyl: Degradation of the Pesticide in Soil under Laboratory Condi- tions: AR 2656 A. (Unpublished study received Dec 1, 1978 under 10182-EX-15; prepared by Imperial Chemical Industries, Ltd., Eng., submitted by ICI Americas, Inc., Wilmington, DE; CDL: 097680-D)

135356 Easton, C.; Seaman, D. (1970) Pyrimidines: Effect of pH on the Hydrolysis of PP 211 and PP 511: Ref. No. AR 2175 A. (Unpub- lished study received Dec 1, 1978 under 10182-EX-15; prepared by Plant Protection Ltd., Eng., submitted by ICI Americas, Inc., Wilmington, DE; CDL:097680-A)

42982401 Hall, B. (1993) The Determination of the Hydrolytic Stability of (carbon 14)-Pirimiphos-Methyl: Lab Project Number: 9545: 382403. Unpublished study prepared by Inveresk Research International. 112 p.

43177601 Hall, B.; Williams, S. (1994) Report Amendment to Study Report (MRID # 42982401): The Determination of the Hydrolytic Stability of (carbon 14)-Pirimiphos-Methyl: Lab

Project Number: 382403: WECO-9206: 9545 ADDENDUM. Unpublished study prepared by Inveresk Research International. 37 p.

SUBMITTED EFFECTS STUDIES:

MRID

43442101 Campbell S, Beavers J. (1994) Primiphos-methyl: An acute oral toxicity study with the northern bobwhite. Lab project number 94041-WECO: 134-103. Unpublished study prepared by Wildlife International Ltd. 59 p.

00103926 Evered P, Doma S. (1976) Pirimiphos-methyl: Toxicity to first instar (*Daphnia magna*). Lab project number TMJ1411B. Unpublished study prepared by ICI Plant Protection Division.

00107423 Fink R. (1974) Eight-day dietary LC_{50} to bobwhite quail with technical pirimiphos methyl – final report. Lab project number 123-101. Unpublished study prepared by ICI United States Inc. and Truslow Farms Inc.

00107422 Fink R. (1974) Eight-day dietary LD_{50} to mallard ducks with technical pirimiphos methyl – final report. Lab project number 123-102. Unpublished study prepared by ICI United States Inc. and Truslow Farms Inc.

00103923 Gage JC, Parkinson GR, and Banham P. (1971) Pirimiphos-Methyl (PP511): Avian Toxicity. Report No. HO/IH/R/329. ICC Industrial Hygiene Research Laboratories.

42037001 Hakin B, Johnson A, Anderson A, et al. (1990) Pirimiphos-methyl dietary toxicity (LD_{50}) to the bobwhite quail. Lab project number JAN 244/90755. Unpublished study prepared by Huntingdon Research Centre. 30 p.

00108078 Hill RW. (1978) Determination of the acute toxicity of pirimiphos-methyl to fathead minnow (*Pimephales promelas*). Lab project number BL/B/1873. Unpublished study prepared by ICI Brixham Laboratory.

00103924 Hill RW. (1978) Determination of the acute toxicity of pirimiphos-methyl to rainbow trout (*Salmo gairdnerii*). Lab project number BL/B/1868. Unpublished study prepared by ICI Brixham Laboratory.

00103925 Hill RW, Maddock BG, Hart B, Gilbert JL. (1975) Determination of the acute toxicity of formulation YF6522A to rainbow trout (*Salmo gairdnerii*) and bluegill sunfish (*Lepomis macrochirus*). Lab project number BL/B/1641. Unpublished study prepared by ICI Brixham Laboratory.

05001991 Stevenson JH. (1978) The acute toxicity of unformulated pesticides to worker honey bees (*Apis mellifera*). Plant Pathology 27(1): 38-40.

Attachment A

PE5 Input Parameters and Aquatic EECs from Pirimiphos Methyl Treated Corn and Sorghum Seeds

Table A-1. PE5 fate and chemistry input parameters for pirimiphos methyl corn and sorghum seed treatment aquatic exposure modeling.

PRZM/EXAMS Input Parameter	Input Value and Unit	Comment	Source
Molecular Weight	305 g/mol		Product Chemistry (MRID 129333)
Hydrolysis ($t_{1/2}$)	7.3 days at pH 5 79 days at pH 7 58 days at pH 9	Average of measured range 54 – 62 days at pH 9	MRID 42982401
Aerobic soil metabolism ($t_{1/2}$)	207.9 days	90th percentile between Peartree7 Sandy Loam, Goar Loam, Frensham Sandy Loam, and Blackborough Peat (high organic matter) England Soils[1]	MRID 135358
Aerobic aquatic metabolism ($t_{1/2}$)	415.8 days	No data available. Computed from twice the aerobic soil metabolism half-life of 207.9 days.	EFED Guidance MRID 135358
Anaerobic aquatic metabolism ($t_{1/2}$)	460.74 days	No data available. Computed from twice the anaerobic soil metabolism half-life of 230.37 days[2].	EFED Guidance MRID 135358
Vapor Pressure at 20 °C	1.1x 10^{-4} torr		Product Chemistry (MRID 129333)
Solubility in Water at 20°C	86 mg/L	Product Chemistry x 10	Product Chemistry (MRID 92147003)
Soil-Water Partition	1946.13 ml/g	Mean of three	EFED Guidance

PRZM/EXAMS Input Parameter	Input Value and Unit	Comment	Source
Coefficient (K_d)		K_{oc} values obtained from databases	Footprint Database SRC Database EPI Suite (PCKOCWIN v 1.66)
Henry's Law Constant	5.105×10^{-6} atm·m^3/mol	Product Chemistry	EPI Suite (HENRYWIN v 3.10)
Aqueous Photolysis ($t_{1/2}$)	0.2 days	DT-50 value	Footprint Database

[1] Value based on preliminary review of aerobic soil metabolism study (MRID 135358).

[2] Anaerobic aquatic metabolism half-life of 230.37 days calculated by the 90th percentile anaerobic soil metabolism half-lives of 98.7 and 245 days for Peartree7 Sandy Loam and Gore Loam England soils, respectively based on preliminary review of anaerobic soil metabolism study (MRID 135358).

Table A-2. PE5 crop management input parameter values for pirimiphos methyl corn and sorghum seed treatments aquatic exposure modeling.

PRZM/EXAMS Input Parameter	Input Value and Unit	Comment
Application Rate and Interval [1]	Corn Seed – 2.2×10^{-4} kg/ha Sorghum Seed – 7.2×10^{-5} kg/ha	Corn application rate assuming seed planting rate of 25 lb of corn seed per acre. [1] Sorghum application rate calculated assuming seed planting rate of 8 lb of sorghum seed per acre. [1]
Crop Scenarios and (Application Date)	OH Corn (Jun. 6) IL Corn (Apr 20) NC Corn (Apr 1) MS Corn (Apr 1) KS Sorghum (Apr 20)	Assumed ~ 15 days prior to crop emergence as specified in PRZM crop scenarios
Chemical Application Method and (Incorporation Depth) [2]	CAM = 4 soil applied, uniform over incorporation depth (Corn Seed - 5 cm) [2] (Sorghum Seed - 2 cm) [3]	Seed treatment
Application Efficiency [2]	1.0	Seed Treatment
Spray Drift Fraction [2]	0	Seed Treatment

[1] Seeding rates obtained from TREX model (version 1.3.1, July 7, 2007)

[2] Incorporation depths for corn obtained from: "How deep should I plant corn seed?" from the Mississippi Research and Extension System, Acessed on-line: <http://msucares.com/crops/corn/corn16.html> January 2009.

[3] Incorporation depths for sorghum seed obtained from: "Grain Sorghum Handbook" from the University of Arkansas Division of Agriculture Cooperative Extension Service, Acessed on-line: <http://www.uaex.edu/Other_Areas/publications/PDF/MP297/2_cultural_practices.pdf > January 2009.

Table A-3. PE5 1-in-10 year EECs in surface water for pirimiphos methyl corn and sorghum seed treatments.

Crop Scenarios and Management	Peak Conc. (µg/L)	21-day Conc. (µg/L)	60-day Conc. (µg/L)
Ohio Corn Seed Treatment	0.000474	0.000276	0.000198
Illinois Corn Seed Treatment	0.000743344	0.00046769	0.0002828
North Carolina Corn Seed Treatment	0.00042345	0.000258362	0.000160404
Mississippi Corn Seed Treatment	**0.001849389**	**0.001146701**	**0.000712544**
Kansas Sorghum Seed Treatment	0.001400717	0.00086529	0.000626237

[1] Maximum concentrations in bold.

Figure A-1. PE5 output file for Ohio corn seed treatment scenario.

stored as OH_Corn.out
Chemical: Pirimiphos Methyl
PRZM environment: modified Tueday, 29 May 2007 at
OHCornSTD.txt 12:59:54
EXAMS environment:
pond298.exv modified Thuday, 29 August 2002 at 16:33:30
modified Wedday, 3 July 2002 at
Metfile: w93815.dvf 09:06:06
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	2.138	1.873	1.235	0.7894	0.7136	0.2876
1962	1.148	1.008	0.8095	0.496	0.4096	0.2629
1963	0.6245	0.5485	0.3992	0.2635	0.2386	0.158
1964	0.8998	0.7827	0.5391	0.3223	0.254	0.1558
1965	0.9745	0.8445	0.523	0.3214	0.2505	0.1495
1966	0.3697	0.3389	0.2473	0.2149	0.1941	0.1424
1967	1.793	1.558	0.9659	0.5826	0.4512	0.2083
1968	1.091	0.9563	0.6382	0.4982	0.4438	0.2438
1969	1.731	1.541	1.09	0.8972	0.7409	0.3531
1970	0.308	0.3019	0.2907	0.2742	0.2445	0.1346
1971	0.8419	0.7345	0.4897	0.4273	0.4011	0.1927
1972	1.095	0.9801	0.6407	0.3751	0.3146	0.2121
1973	0.7925	0.6976	0.4903	0.382	0.3489	0.2053
1974	2.005	1.775	1.262	0.7449	0.7511	0.3244
1975	1.171	1.073	0.7069	0.4572	0.3999	0.2147
1976	0.7741	0.6808	0.5195	0.2993	0.2359	0.1404
1977	0.7655	0.714	0.5513	0.3017	0.2909	0.1815
1978	1.289	1.144	0.8677	0.7187	0.6631	0.363
1979	1.389	1.225	0.9234	0.7389	0.7177	0.3859
1980	1.973	1.788	1.113	0.6957	0.5631	0.2871
1981	1.292	1.134	0.784	0.6219	0.5601	0.3135
1982	1.343	1.183	0.8873	0.5844	0.4948	0.3394
1983	2.016	1.765	1.186	0.8671	0.6798	0.3501
1984	0.5059	0.4442	0.3636	0.2881	0.2781	0.1867
1985	0.7773	0.736	0.5861	0.4544	0.3338	0.1916
1986	1.534	1.362	1.076	0.8855	0.7231	0.4267
1987	2.125	1.888	1.199	0.6527	0.5026	0.2476
1988	1.003	0.8913	0.7136	0.5125	0.4958	0.2967
1989	1.284	1.133	0.7463	0.5069	0.4462	0.3147
1990	3.499	3.09	2.023	1.118	0.87	0.4032

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	3.499	3.09	2.023	1.118	0.87	0.4267
0.064516	2.138	1.888	1.262	0.8972	0.7511	0.4032
0.096774	2.125	1.873	1.235	0.8855	0.7409	0.3859

0.129032	2.016	1.788	1.199	0.8671	0.7231	0.363
0.16129	2.005	1.775	1.186	0.7894	0.7177	0.3531
0.193548	1.973	1.765	1.113	0.7449	0.7136	0.3501
0.225806	1.793	1.558	1.09	0.7389	0.6798	0.3394
0.258065	1.731	1.541	1.076	0.7187	0.6631	0.3244
0.290323	1.534	1.362	0.9659	0.6957	0.5631	0.3147
0.322581	1.389	1.225	0.9234	0.6527	0.5601	0.3135
0.354839	1.343	1.183	0.8873	0.6219	0.5026	0.2967
0.387097	1.292	1.144	0.8677	0.5844	0.4958	0.2876
0.419355	1.289	1.134	0.8095	0.5826	0.4948	0.2871
0.451613	1.284	1.133	0.784	0.5125	0.4512	0.2629
0.483871	1.171	1.073	0.7463	0.5069	0.4462	0.2476
0.516129	1.148	1.008	0.7136	0.4982	0.4438	0.2438
0.548387	1.095	0.9801	0.7069	0.496	0.4096	0.2147
0.580645	1.091	0.9563	0.6407	0.4572	0.4011	0.2121
0.612903	1.003	0.8913	0.6382	0.4544	0.3999	0.2083
0.645161	0.9745	0.8445	0.5861	0.4273	0.3489	0.2053
0.677419	0.8998	0.7827	0.5513	0.382	0.3338	0.1927
0.709677	0.8419	0.736	0.5391	0.3751	0.3146	0.1916
0.741935	0.7925	0.7345	0.523	0.3223	0.2909	0.1867
0.774194	0.7773	0.714	0.5195	0.3214	0.2781	0.1815
0.806452	0.7741	0.6976	0.4903	0.3017	0.254	0.158
0.83871	0.7655	0.6808	0.4897	0.2993	0.2505	0.1558
0.870968	0.6245	0.5485	0.3992	0.2881	0.2445	0.1495
0.903226	0.5059	0.4442	0.3636	0.2742	0.2386	0.1424
0.935484	0.3697	0.3389	0.2907	0.2635	0.2359	0.1404
0.967742	0.308	0.3019	0.2473	0.2149	0.1941	0.1346
0.1	2.1141	1.8645	1.2314	0.88366	0.73912	0.38361
					Average of yearly averages:	0.255777

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: OH_Corn

Metfile:	w93815.dvf
PRZM scenario:	OHCornSTD.txt
EXAMS environment file:	pond298.exv
Chemical Name:	Pirimiphos Methyl

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	305	g/mol	
Henry's Law Const.	henry	5.10E-06	atm-m^3/mol	
Vapor Pressure	vapr	1.10E-04	torr	
Solubility	sol	86	mg/L	
Kd	Kd		mg/L	

Koc	Koc	1946.13	mg/L	
Photolysis half-life	kdp	0.2	days	Half-life
Aerobic Aquatic Metabolism	kbacw	415.8	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	460.74	days	Halfife
Aerobic Soil Metabolism	asm	207.9	days	Halfife
Hydrolysis:	pH 5	7.3	days	Half-life
Hydrolysis:	pH 7	79	days	Half-life
Hydrolysis:	pH 9	58	days	Half-life
Method:	CAM	4	integer	See PRZM manual
Incorporation Depth:	DEPI	5	cm	
Application Rate:	TAPP	1	kg/ha	
Application Efficiency:	APPEFF	1	fraction	
Spray Drift	DRFT	0	fraction of application rate applied to pond	
Application Date	Date	6-6	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	3		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC			
Flag for Index Res. Run	IR	EPA Pond		
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

[1] Modeled application rate normalized to 1 kg a.i./ha. Environmental EECs determined by multiplying modeled EECs by the maximum labeled application rate of 2.2×10^{-4} kg a.i./ha (determined per Table A-2).

Figure A-2. PE5 output file for Illinois corn seed treatment scenario.

stored as IL_Corn.out
Chemical: Pirimiphos Methyl
PRZM environment: modified Tueday, 29 May 2007 at
ILCornSTD.txt 12:55:34
EXAMS environment:
pond298.exv modified Thuday, 29 August 2002 at 16:33:30
modified Wedday, 3 July 2002 at
Metfile: w14842.dvf 08:04:38
Water segment concentrations (ppb)

Year		Peak	96 hr	21 Day	60 Day	90 Day		Yearly
	1961	1.31	1.142	0.934	0.5591		0.4905	0.2427
	1962	1.146	1.016	0.7353	0.5796		0.4979	0.2705
	1963	3.08	2.684	1.702	1.044		0.8836	0.4009
	1964	2.001	1.822	1.267	0.7471		0.7182	0.3766
	1965	1.101	1.018	0.8417	0.7006		0.6353	0.4715
	1966	1.284	1.141	1.008	0.7549		0.6332	0.396
	1967	1.738	1.522	0.9874	0.6414		0.5563	0.3367
	1968	2.363	2.074	1.383	1.112		0.967	0.4297
	1969	0.9138	0.8133	0.6928	0.5083		0.4148	0.2969
	1970	3.403	2.962	2.111	1.379		1.113	0.5548
	1971	0.8389	0.7435	0.5432	0.3748		0.3261	0.2468
	1972	0.7559	0.6686	0.4728	0.3647		0.3342	0.2275
	1973	1.847	1.625	1.249	0.9358		0.8464	0.4494
	1974	2.312	2.028	1.314	0.9189		0.766	0.3866
	1975	1.012	0.9058	0.7014	0.5107		0.5328	0.3344
	1976	3.345	2.92	2.167	1.372		1.146	0.5126
	1977	2.223	2.013	1.352	0.8171		0.6796	0.4319
	1978	1.957	1.771	1.305	0.9014		0.7704	0.3671
	1979	1.5	1.324	0.9204	0.5576		0.4674	0.2855
	1980	4.155	3.613	2.284	1.263		1.034	0.4426
	1981	1.86	1.661	1.326	0.9447		0.8924	0.4757
	1982	1.349	1.2	0.9947	0.7373		0.6909	0.3948
	1983	2.941	2.592	1.88	1.258		1.038	0.4855
	1984	1.651	1.456	1.062	0.8737		0.7357	0.3887
	1985	0.5337	0.4889	0.3512	0.2788		0.2384	0.2131
	1986	1.552	1.384	1.056	0.8794		0.7743	0.3939
	1987	1.251	1.105	0.7318	0.4474		0.42	0.2438
	1988	0.2845	0.252	0.2279	0.2034		0.1783	0.1227
	1989	1.403	1.24	0.8212	0.4853		0.389	0.1868
	1990	1.384	1.226	0.8865	0.7665		0.712	0.3729

Sorted results

Prob.		Peak	96 hr	21 Day	60 Day	90 Day		Yearly
	0.032258	4.155	3.613	2.284	1.379		1.146	0.5548

0.064516	3.403	2.962	2.167	1.372	1.113	0.5126
0.096774	3.345	2.92	2.111	1.263	1.038	0.4855
0.129032	3.08	2.684	1.88	1.258	1.034	0.4757
0.16129	2.941	2.592	1.702	1.112	0.967	0.4715
0.193548	2.363	2.074	1.383	1.044	0.8924	0.4494
0.225806	2.312	2.028	1.352	0.9447	0.8836	0.4426
0.258065	2.223	2.013	1.326	0.9358	0.8464	0.4319
0.290323	2.001	1.822	1.314	0.9189	0.7743	0.4297
0.322581	1.957	1.771	1.305	0.9014	0.7704	0.4009
0.354839	1.86	1.661	1.267	0.8794	0.766	0.396
0.387097	1.847	1.625	1.249	0.8737	0.7357	0.3948
0.419355	1.738	1.522	1.062	0.8171	0.7182	0.3939
0.451613	1.651	1.456	1.056	0.7665	0.712	0.3887
0.483871	1.552	1.384	1.008	0.7549	0.6909	0.3866
0.516129	1.5	1.324	0.9947	0.7471	0.6796	0.3766
0.548387	1.403	1.24	0.9874	0.7373	0.6353	0.3729
0.580645	1.384	1.226	0.934	0.7006	0.6332	0.3671
0.612903	1.349	1.2	0.9204	0.6414	0.5563	0.3367
0.645161	1.31	1.142	0.8865	0.5796	0.5328	0.3344
0.677419	1.284	1.141	0.8417	0.5591	0.4979	0.2969
0.709677	1.251	1.105	0.8212	0.5576	0.4905	0.2855
0.741935	1.146	1.018	0.7353	0.5107	0.4674	0.2705
0.774194	1.101	1.016	0.7318	0.5083	0.42	0.2468
0.806452	1.012	0.9058	0.7014	0.4853	0.4148	0.2438
0.83871	0.9138	0.8133	0.6928	0.4474	0.389	0.2427
0.870968	0.8389	0.7435	0.5432	0.3748	0.3342	0.2275
0.903226	0.7559	0.6686	0.4728	0.3647	0.3261	0.2131
0.935484	0.5337	0.4889	0.3512	0.2788	0.2384	0.1868
0.967742	0.2845	0.252	0.2279	0.2034	0.1783	0.1227
0.1	3.3185	2.8964	2.0879	1.2625	1.0376	0.48452
					Average of yearly averages:	0.357953

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:

Output File:	IL_Corn
Metfile:	w14842.dvf
PRZM scenario:	ILCornSTD.txt
EXAMS environment file:	pond298.exv
Chemical Name:	Pirimiphos Methyl

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	305	g/mol	
Henry's Law Const.	henry	5.10E-06	atm-m^3/mol	
Vapor Pressure	vapr	1.10E-04	torr	

Solubility	sol	86	mg/L	
Kd	Kd		mg/L	
Koc	Koc	1946.13	mg/L	
Photolysis half-life	kdp	0.2	days	Half-life
Aerobic Aquatic Metabolism	kbacw	415.8	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	460.74	days	Halfife
Aerobic Soil Metabolism	asm	207.9	days	Halfife
Hydrolysis:	pH 5	7.3	days	Half-life
Hydrolysis:	pH 7	79	days	Half-life
Hydrolysis:	pH 9	58	days	Half-life
Method:	CAM	4	integer	See PRZM manual
Incorporation Depth:	DEPI	5	cm	
Application Rate:	TAPP	1	kg/ha	
Application Efficiency:	APPEFF	1	fraction	
Spray Drift	DRFT	0	fraction of application rate applied to pond	
Application Date	Date	20-4	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	3		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC			
Flag for Index Res. Run	IR	EPA Pond		
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

[1] Modeled application rate normalized to 1 kg a.i./ha. Environmental EECs determined by multiplying modeled EECs by the maximum labeled application rate of 2.2×10^{-4} kg a.i./ha (determined per Table A-2).

Figure A-3. PE5 output file for North Carolina corn seed treatment scenario.

stored as NC_Corn.out
Chemical: Pirimiphos Methyl
PRZM environment: modified Tueday, 29 May 2007 at
NCcornESTD.txt 12:58:28
EXAMS environment:
pond298.exv modified Thuday, 29 August 2002 at 16:33:30
modified Wedday, 3 July 2002 at
Metfile: w13722.dvf 09:05:50
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.3581	0.3256	0.2442	0.1641	0.1517	0.077
1962	0.8269	0.7302	0.5973	0.4557	0.3675	0.2014
1963	0.9366	0.813	0.5436	0.3261	0.261	0.1565
1964	1.899	1.649	1.019	0.5545	0.4548	0.2816
1965	2.068	1.8	1.31	0.8594	0.6763	0.2617
1966	0.6704	0.5881	0.4009	0.3283	0.3107	0.1754
1967	1.277	1.113	0.7852	0.482	0.4194	0.2004
1968	0.5919	0.517	0.327	0.2523	0.2244	0.1481
1969	0.6312	0.5684	0.4379	0.3227	0.2885	0.1523
1970	0.5703	0.4978	0.374	0.2842	0.2272	0.1207
1971	0.5727	0.5236	0.4228	0.3199	0.2922	0.1855
1972	0.8584	0.7495	0.5942	0.4491	0.4355	0.2178
1973	1.742	1.54	1.168	0.7337	0.6571	0.3273
1974	0.9501	0.8317	0.6244	0.4022	0.3247	0.1755
1975	1.077	0.9444	0.6312	0.3452	0.3064	0.1567
1976	0.6716	0.5926	0.4561	0.3107	0.2524	0.155
1977	0.744	0.6548	0.4346	0.3027	0.2817	0.1873
1978	3.604	3.117	2.034	1.131	0.912	0.3522
1979	0.808	0.707	0.4519	0.3122	0.2976	0.1986
1980	1.385	1.202	0.7471	0.4326	0.3797	0.1996
1981	0.7472	0.6603	0.4597	0.3519	0.3136	0.1693
1982	1.423	1.248	0.8002	0.5055	0.4035	0.1812
1983	1.307	1.139	0.7076	0.5042	0.4109	0.178
1984	1.383	1.204	0.7394	0.5368	0.4661	0.2192
1985	0.658	0.5776	0.4017	0.3029	0.2956	0.1707
1986	1.542	1.348	0.9128	0.5509	0.4445	0.2074
1987	1.813	1.575	1.022	0.5576	0.4544	0.2479
1988	0.6849	0.5968	0.374	0.2575	0.211	0.1451
1989	0.669	0.6034	0.4373	0.3466	0.3341	0.1699
1990	0.7206	0.6328	0.4302	0.3553	0.2803	0.1324

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	3.604	3.117	2.034	1.131	0.912	0.3522
0.064516	2.068	1.8	1.31	0.8594	0.6763	0.3273
0.096774	1.899	1.649	1.168	0.7337	0.6571	0.2816

0.129032	1.813	1.575	1.022	0.5576	0.4661	0.2617
0.16129	1.742	1.54	1.019	0.5545	0.4548	0.2479
0.193548	1.542	1.348	0.9128	0.5509	0.4544	0.2192
0.225806	1.423	1.248	0.8002	0.5368	0.4445	0.2178
0.258065	1.385	1.204	0.7852	0.5055	0.4355	0.2074
0.290323	1.383	1.202	0.7471	0.5042	0.4194	0.2014
0.322581	1.307	1.139	0.7394	0.482	0.4109	0.2004
0.354839	1.277	1.113	0.7076	0.4557	0.4035	0.1996
0.387097	1.077	0.9444	0.6312	0.4491	0.3797	0.1986
0.419355	0.9501	0.8317	0.6244	0.4326	0.3675	0.1873
0.451613	0.9366	0.813	0.5973	0.4022	0.3341	0.1855
0.483871	0.8584	0.7495	0.5942	0.3553	0.3247	0.1812
0.516129	0.8269	0.7302	0.5436	0.3519	0.3136	0.178
0.548387	0.808	0.707	0.4597	0.3466	0.3107	0.1755
0.580645	0.7472	0.6603	0.4561	0.3452	0.3064	0.1754
0.612903	0.744	0.6548	0.4519	0.3283	0.2976	0.1707
0.645161	0.7206	0.6328	0.4379	0.3261	0.2956	0.1699
0.677419	0.6849	0.6034	0.4373	0.3227	0.2922	0.1693
0.709677	0.6716	0.5968	0.4346	0.3199	0.2885	0.1567
0.741935	0.6704	0.5926	0.4302	0.3122	0.2817	0.1565
0.774194	0.669	0.5881	0.4228	0.3107	0.2803	0.155
0.806452	0.658	0.5776	0.4017	0.3029	0.261	0.1523
0.83871	0.6312	0.5684	0.4009	0.3027	0.2524	0.1481
0.870968	0.5919	0.5236	0.374	0.2842	0.2272	0.1451
0.903226	0.5727	0.517	0.374	0.2575	0.2244	0.1324
0.935484	0.5703	0.4978	0.327	0.2523	0.211	0.1207
0.967742	0.3581	0.3256	0.2442	0.1641	0.1517	0.077
0.1	1.8904	1.6416	1.1534	0.71609	0.638	0.27961
					Average of yearly averages:	0.191723

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: NC_Corn

Metfile:	w13722.dvf			
PRZM scenario:	NCcornESTD.txt			
EXAMS environment file:	pond298.exv			
Chemical Name:	Pirimiphos Methyl			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	305	g/mol	
Henry's Law Const.	henry	5.10E-06	atm-m^3/mol	
Vapor Pressure	vapr	1.10E-04	torr	
Solubility	sol	86	mg/L	
Kd	Kd		mg/L	

Koc	Koc	1946.13	mg/L	
Photolysis half-life	kdp	0.2	days	Half-life
Aerobic Aquatic Metabolism	kbacw	415.8	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	460.74	days	Halfife
Aerobic Soil Metabolism	asm	207.9	days	Halfife
Hydrolysis:	pH 5	7.3	days	Half-life
Hydrolysis:	pH 7	79	days	Half-life
Hydrolysis:	pH 9	58	days	Half-life
Method:	CAM	4	integer	See PRZM manual
Incorporation Depth:	DEPI	5	cm	
Application Rate:	TAPP	1	kg/ha	
Application Efficiency:	APPEFF	1	fraction	
Spray Drift	DRFT	0	fraction of application rate applied to pond	
Application Date	Date	1-4	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	3		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC			
Flag for Index Res. Run	IR	EPA Pond		
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

[1] Modeled application rate normalized to 1 kg a.i./ha. Environmental EECs determined by multiplying modeled EECs by the maximum labeled application rate of 2.2×10^{-4} kg a.i./ha (determined per Table A-2).

Figure A-4. PE5 output file for Mississippi corn seed treatment scenario.

stored as MS_Corn.out
Chemical: Pirimiphos Methyl
PRZM environment: modified Tueday, 29 May 2007 at
MScornSTD.txt 12:57:40
EXAMS environment:
pond298.exv modified Thuday, 29 August 2002 at 16:33:30
modified Wedday, 3 July 2002 at
Metfile: w03940.dvf 09:05:46
Water segment concentrations (ppb)

Year		Peak	96 hr	21 Day	60 Day	90 Day		Yearly
	1961	1.42	1.256	0.8382	0.7283		0.6105	0.2963
	1962	5.288	4.825	3.326	2.032		1.6	0.6199
	1963	1.969	1.723	1.091	0.6652		0.5411	0.3106
	1964	4.79	4.278	3.375	2.236		1.757	0.7545
	1965	2.165	1.868	1.162	0.6151		0.4706	0.2356
	1966	2.393	2.238	1.612	1.271		1.008	0.4645
	1967	3.256	2.845	1.985	1.365		1.118	0.4632
	1968	3.506	3.127	2.213	1.641		1.334	0.5304
	1969	4.48	3.893	2.452	1.404		1.087	0.4602
	1970	1.075	0.9509	0.785	0.5788		0.4952	0.3106
	1971	3.451	3.006	2.357	1.709		1.348	0.5893
	1972	1.374	1.208	0.9484	0.5763		0.4596	0.2701
	1973	5.218	4.731	3.034	1.888		1.488	0.582
	1974	4.641	4.011	2.634	1.552		1.26	0.5491
	1975	2.105	1.869	1.495	1.04		0.9109	0.5068
	1976	2.451	2.15	1.64	1.118		0.9545	0.4192
	1977	5.095	4.431	3	1.868		1.479	0.6461
	1978	1.825	1.628	1.444	0.9516		0.7775	0.3842
	1979	9.036	7.933	5.313	3.415		2.756	1.162
	1980	8.586	7.826	5.407	3.286		2.548	0.9443
	1981	2.092	1.894	1.397	1.112		0.9309	0.4372
	1982	3.846	3.352	2.263	1.315		1.232	0.6344
	1983	9.286	8.429	6.437	3.934		3.108	1.158
	1984	1.501	1.333	0.9335	0.8435		0.7208	0.4196
	1985	1.521	1.327	0.8375	0.4957		0.4521	0.271
	1986	2.952	2.573	1.806	1.085		0.8816	0.3776
	1987	1.43	1.277	0.9085	0.6105		0.5395	0.2739
	1988	3.837	3.351	2.141	1.494		1.176	0.5411
	1989	2.739	2.463	1.919	1.493		1.25	0.5639
	1990	1.892	1.667	1.147	0.8359		0.6703	0.3308

Sorted results

Prob.		Peak	96 hr	21 Day	60 Day	90 Day		Yearly
	0.032258	9.286	8.429	6.437	3.934		3.108	1.162

0.064516	9.036	7.933	5.407	3.415	2.756	1.158
0.096774	8.586	7.826	5.313	3.286	2.548	0.9443
0.129032	5.288	4.825	3.375	2.236	1.757	0.7545
0.16129	5.218	4.731	3.326	2.032	1.6	0.6461
0.193548	5.095	4.431	3.034	1.888	1.488	0.6344
0.225806	4.79	4.278	3	1.868	1.479	0.6199
0.258065	4.641	4.011	2.634	1.709	1.348	0.5893
0.290323	4.48	3.893	2.452	1.641	1.334	0.582
0.322581	3.846	3.352	2.357	1.552	1.26	0.5639
0.354839	3.837	3.351	2.263	1.494	1.25	0.5491
0.387097	3.506	3.127	2.213	1.493	1.232	0.5411
0.419355	3.451	3.006	2.141	1.404	1.176	0.5304
0.451613	3.256	2.845	1.985	1.365	1.118	0.5068
0.483871	2.952	2.573	1.919	1.315	1.087	0.4645
0.516129	2.739	2.463	1.806	1.271	1.008	0.4632
0.548387	2.451	2.238	1.64	1.118	0.9545	0.4602
0.580645	2.393	2.15	1.612	1.112	0.9309	0.4372
0.612903	2.165	1.894	1.495	1.085	0.9109	0.4196
0.645161	2.105	1.869	1.444	1.04	0.8816	0.4192
0.677419	2.092	1.868	1.397	0.9516	0.7775	0.3842
0.709677	1.969	1.723	1.162	0.8435	0.7208	0.3776
0.741935	1.892	1.667	1.147	0.8359	0.6703	0.3308
0.774194	1.825	1.628	1.091	0.7283	0.6105	0.3106
0.806452	1.521	1.333	0.9484	0.6652	0.5411	0.3106
0.83871	1.501	1.327	0.9335	0.6151	0.5395	0.2963
0.870968	1.43	1.277	0.9085	0.6105	0.4952	0.2739
0.903226	1.42	1.256	0.8382	0.5788	0.4706	0.271
0.935484	1.374	1.208	0.8375	0.5763	0.4596	0.2701
0.967742	1.075	0.9509	0.785	0.4957	0.4521	0.2356
0.1	8.2562	7.5259	5.1192	3.181	2.4689	0.92532
					Average of yearly averages:	0.51688

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:

Output File:	MS_Corn
Metfile:	w03940.dvf
PRZM scenario:	MScornSTD.txt
EXAMS environment file:	pond298.exv
Chemical Name:	Pirimiphos Methyl

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	305	g/mol	
Henry's Law Const.	henry	5.10E-06	atm-m^3/mol	
Vapor Pressure	vapr	1.10E-04	torr	

Figure A-5. PE5 output file for Kansas sorghum seed treatment scenario.

stored as KS_Sorg.out
Chemical: Pirimiphos Methyl
PRZM environment: modified Tueday, 29 May 2007 at
KSsorghumSTD.txt 12:55:46
EXAMS environment:
pond298.exv modified Thuday, 29 August 2002 at 16:33:30
modified Wedday, 3 July 2002 at
Metfile: w13996.dvf 09:04:44
Water segment concentrations (ppb)

Year		Peak	96 hr	21 Day	60 Day	90 Day		Yearly
	1961	2.421	2.099	1.56	1.097		1.025	0.4823
	1962	4.879	4.178	2.668	1.692		1.442	0.6738
	1963	2.105	1.855	1.461	0.98		0.9677	0.4612
	1964	2.733	2.38	1.76	1.065		1.022	0.5557
	1965	2.562	2.322	1.684	1.428		1.155	0.6045
	1966	4.417	3.918	2.593	1.536		1.245	0.505
	1967	7.218	6.453	4.726	3.101		2.478	1.064
	1968	3.779	3.307	2.818	1.813		1.482	0.781
	1969	6.29	5.476	4.003	2.826		2.459	1.019
	1970	2.688	2.377	1.992	1.508		1.204	0.6223
	1971	3.438	3.088	2.175	1.391		1.13	0.5461
	1972	3	2.631	1.956	1.285		1.067	0.5948
	1973	4.54	3.972	2.633	1.708		1.752	1.057
	1974	2.309	2.053	1.474	1.292		1.108	0.6912
	1975	1.739	1.611	1.11	0.7564		0.6022	0.362
	1976	2.468	2.143	1.412	1.114		0.9079	0.391
	1977	6.328	5.568	3.92	3.486		2.896	1.22
	1978	5.018	4.559	3.006	2.008		1.686	0.9031
	1979	2.485	2.186	1.7	1.17		1.029	0.6146
	1980	3.515	3.075	2.217	1.252		1.179	0.6928
	1981	5.922	5.181	3.349	2.523		2.285	1.027
	1982	4.971	4.424	3.289	2.305		1.987	0.9198
	1983	1.645	1.45	1.153	0.9275		0.8774	0.455
	1984	5.411	4.689	3.24	2.026		1.592	0.6653
	1985	2.055	1.902	1.342	0.9791		0.9571	0.6288
	1986	3.613	3.294	2.727	1.734		1.449	0.708
	1987	2.033	1.791	1.397	1.129		0.9487	0.5024
	1988	2.182	1.985	1.351	0.8463		0.7459	0.3555
	1989	3.926	3.435	2.435	1.611		1.528	0.8618
	1990	4.25	3.712	2.346	1.598		1.409	0.6978

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day		Yearly
0.032258	7.218	6.453	4.726	3.486		2.896	1.22

0.064516	6.328	5.568	4.003	3.101	2.478	1.064
0.096774	6.29	5.476	3.92	2.826	2.459	1.057
0.129032	5.922	5.181	3.349	2.523	2.285	1.027
0.16129	5.411	4.689	3.289	2.305	1.987	1.019
0.193548	5.018	4.559	3.24	2.026	1.752	0.9198
0.225806	4.971	4.424	3.006	2.008	1.686	0.9031
0.258065	4.879	4.178	2.818	1.813	1.592	0.8618
0.290323	4.54	3.972	2.727	1.734	1.528	0.781
0.322581	4.417	3.918	2.668	1.708	1.482	0.708
0.354839	4.25	3.712	2.633	1.692	1.449	0.6978
0.387097	3.926	3.435	2.593	1.611	1.442	0.6928
0.419355	3.779	3.307	2.435	1.598	1.409	0.6912
0.451613	3.613	3.294	2.346	1.536	1.245	0.6738
0.483871	3.515	3.088	2.217	1.508	1.204	0.6653
0.516129	3.438	3.075	2.175	1.428	1.179	0.6288
0.548387	3	2.631	1.992	1.391	1.155	0.6223
0.580645	2.733	2.38	1.956	1.292	1.13	0.6146
0.612903	2.688	2.377	1.76	1.285	1.108	0.6045
0.645161	2.562	2.322	1.7	1.252	1.067	0.5948
0.677419	2.485	2.186	1.684	1.17	1.029	0.5557
0.709677	2.468	2.143	1.56	1.129	1.025	0.5461
0.741935	2.421	2.099	1.474	1.114	1.022	0.505
0.774194	2.309	2.053	1.461	1.097	0.9677	0.5024
0.806452	2.182	1.985	1.412	1.065	0.9571	0.4823
0.83871	2.105	1.902	1.397	0.98	0.9487	0.4612
0.870968	2.055	1.855	1.351	0.9791	0.9079	0.455
0.903226	2.033	1.791	1.342	0.9275	0.8774	0.391
0.935484	1.739	1.611	1.153	0.8463	0.7459	0.362
0.967742	1.645	1.45	1.11	0.7564	0.6022	0.3555
0.1	6.2532	5.4465	3.8629	2.7957	2.4416	1.054
					Average of yearly averages:	0.68876

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:

Output File:	KS_Sorg
Metfile:	w13996.dvf
PRZM scenario:	KSsorghumSTD.txt
EXAMS environment file:	pond298.exv
Chemical Name:	Pirimiphos Methyl

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	305	g/mol	
Henry's Law Const.	henry	5.10E-06	atm-m^3/mol	
Vapor Pressure	vapr	1.10E-04	torr	

Solubility	sol	86	mg/L	
Kd	Kd		mg/L	
Koc	Koc	1946.13	mg/L	
Photolysis half-life	kdp	0.2	days	Half-life
Aerobic Aquatic Metabolism	kbacw	415.8	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	460.74	days	Halfife
Aerobic Soil Metabolism	asm	207.9	days	Halfife
Hydrolysis:	pH 5	7.3	days	Half-life
Hydrolysis:	pH 7	79	days	Half-life
Hydrolysis:	pH 9	58	days	Half-life
Method:	CAM	4	integer	See PRZM manual
Incorporation Depth:	DEPI	2	cm	
Application Rate:	TAPP	1	kg/ha	
Application Efficiency:	APPEFF	1	fraction	
Spray Drift	DRFT	0	fraction of application rate applied to pond	
Application Date	Date	20-4	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	3		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC			
Flag for Index Res. Run	IR	EPA Pond		
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

[1] Modeled application rate normalized to 1 kg a.i./ha. Environmental EECs determined by multiplying modeled EECs by the maximum labeled application rate of 7.2×10^{-5} kg a.i./ha (determined per Table A-2).

Attachment B

Aquatic EECs from Pirimiphos Methyl Cattle Ear Tags

Table B-1. EECs in surface water for loss of one ear tag in pond scenario. EECs calculated by KdCalc program (Parker, 2002).

Water/Sediment Depth (cm)	Peak Conc. (µg/L)	21-day Conc. (µg/L)	60-day Conc. (µg/L)
200/5	0.0208	0.00029	0.00010
100/5	0.0234	0.00032	0.00011
50/5	**0.0249**	**0.00034**	**0.00012**

[1] Mass loading in pond based on 1.92 g of pirimiphos methyl per ear tag per maximum labeled use rate.
[2] Koc value of 1,946.13 L/kg used in KdCalc program per Table A-1.
[3] Aqueous photolysis half-life of 0.2 days used in KdCalc program per Table 2 to determine 21-day and 60-day concentrations.
4 Maximum concentrations in bold.

Table B-2. EECs in surface water for entry of cattle into pond scenario. EECs calculated by KdCalc program (Parker, 2002).

Number of Cattle in Pond	Percent of Applied Residue on Cow Hide	Percent of Cow Surface Submerged	Water/Sediment Depth (cm)	Peak Conc. (µg/L)	21-day Conc. (µg/L)	60-day Conc. (µg/L)
20	10%	60%	200/5	**0.05**	**0.00069**	**0.00024**
20	10%	40%	200/5	0.0333	0.00046	0.00016
20	10%	20%	200/5	0.0167	0.00023	0.00008

[1] Mass loading in pond based on 4.608 g, 3.702 g, and 1.536 g for the 60 percent, 40 percent, and 20 percent of cow surface submerged scenarios, respectively. Pirimiphos methyl base residue loading per ear tag per maximum labeled use rate, the assumption of ten percent of applied residues dissipating on to cow hide, and the entry of 20 cows into the pond.
[2] Koc value of 1,946.13 L/kg used in KdCalc program per Table A-1.
[3] Aqueous photolysis half-life of 0.2 days used in KdCalc program per Table 2 to determine 21-day and 60-day concentrations.
[4] Maximum concentrations in bold.

Table B-3. EECs in surface water for runoff cattle into pond scenario. EECs calculated by KdCalc program (Parker, 2002).

Number of Cattle in Feedlot	Percent of Applied Washed Off Cow Hide	Water/Sediment Depth (cm)	Peak Conc. (µg/L)	21-day Conc. (µg/L)	60-day Conc. (µg/L)
1,000	20%	200/5	**0.8334**	**0.01145**	**0.00401**
1,000	10%	200/5	0.4167	0.00573	0.00200
1,000	5%	200/5	0.208	0.00286	0.00100

[1] Mass loading in pond based on 76.8 g, 38.4 g, and 19.6 g for the 20 percent, 10 percent, and 5 percent scenarios of pirimiphos methyl residues on cow hide being washed off directly into pond, respectively. Pirimiphos methyl base residue loading per ear tag per maximum labeled use rate, and 1,000 cattle population on feed lot (USDA, 2009).

[2] Koc value of 1,946.13 L/kg used in KdCalc program per Table A-1.

[3] Aqueous photolysis half-life of 0.2 days used in KdCalc program per Table 2 to determine 21-day and 60-day concentrations.

[4] EECs are based on the assumption of one rain event only.

[5] Maximum concentrations in bold.

Attachment C

Tables of Justification for Environmental Fate and Ecological Data Requirements

Environmental Fate Data Justifications for Pirimiphos Methyl

Guideline Number: 835.1230 Study Title: Leaching Adsorption/Desorption (Batch Equilibrium) Study
Rationale for Requiring the Data
EFED believes that a guideline batch equilibrium study would greatly increase certainty regarding estimated exposure concentrations associated with cattle ear tags. Preliminary acute pond EECs indicate that primiphos methyl washoff from cattle hide may pose exposure levels of concern to aquatic invertebrates. There are a wide range in K_{oc} values of 138.4 ml/g to 4,600 ml/g obtained from various databases as presented in Table 4. A guideline study will minimize uncertainty associated with partitioning between the sediment and the water.
Practical Utility of the Data
How will the data be used? This data will be used to calculate estimated exposure concentration associated with the pirimiphos methyl cattle ear tag uses. **How could the data impact the Agency's future decision-making?** If future endangered species risk assessments are performed without these data, the Agency would have to assume that pirimiphos methyl residues from cattle ear tag use would exceed the acceptable level of risk for aquatic invertebrates on an acute and potentially chronic basis. As a result, pirimiphos methyl might need to be restricted in areas where endangered species could be exposed. The lack of these data will limit the flexibility the Agency and registrants have in coming into compliance with the Endangered Species Act and could result in use restrictions for primiphos methyl which are unnecessarily severe.

Ecological Effects Data Justifications for Pirimiphos Methyl

Guideline Number: 850.2300 **Study Title: Avian Reproduction**
Rationale for Requiring the Data
For pesticides which may be available as residues on avian feed items, avian reproduction testing (Guideline 850.2300) is required. The avian reproduction toxicity test for pirimiphos methyl is justified because residues of pirimiphos methyl applied to stored corn and sorghum may be bioavailable if birds feed on planted seeds. While the compound is highly toxic to birds on an acute toxicity basis. acute data alone are insufficient to describe effects to birds under continued or repeated sublethal exposure. In addition, there is capacity for continued exposure to birds during the breeding season. Research has shown that even short-term dietary exposures to several organophosphorus insecticides can lead to significant adverse reproductive effects, such as reduced egg production and eggshell thinning.
Practical Utility of the Data
How will the data be used? The avian reproduction studies are needed for future regulatory decisions, particularly for an endangered species assessment. The data would allow the Agency to quantify the potential for chronic risk to avian species from the use of pirimiphos methyl, as measured by effects on reproduction and hatchling survival. **How could the data impact the Agency's future decision-making?** If future endangered species risk assessments are performed without these data, the Agency would have to assume that pirimiphos methyl may affect endangered birds directly (and endangered species from other taxa indirectly), and use of pirimiphos methyl might need to be restricted in areas where endangered species could be exposed. The lack of these data will limit the flexibility the Agency and registrants have to comply with the Endangered Species Act and could result in use restrictions for pirimiphos methyl which are unnecessarily severe.

Guideline Number: 850.1300 Study Title: Aquatic Invertebrate Life-Cycle (freshwater)
Rationale for Requiring the Data
Pirimiphos methyl is classified as very highly toxic to freshwater invertebrates on an acute basis. The high acute toxicity of pirimiphos methyl to freshwater invertebrates indicates the potential for chronic risk to animals in this taxon. Potential risks to endangered and non-listed freshwater aquatic invertebrates exist due to washoff exposure from pirimiphos methyl cattle ear tags (Table B-3). The highest preliminary EEC is 0.8334 ppb, assuming 20 percent of maximum pirimiphos methyl residues from the hide of treated cattle wash into a water body. The submitted freshwater invertebrate acute toxicity study for pirimiphos methyl shows a 48-hour EC_{50} of 0.11 ppb (MRID 00103926, Table 4). In addition, multiple rain events may cause repeat exposure instances. While the potential for acute risk has been demonstrated, these data alone are insufficient to describe lethal and sublethal effects to invertebrates under continued or repeated exposure. Without this study, the Agency would have to presume chronic risk to endangered and non-listed freshwater invertebrates, but would not be able to quantify the risk.
Practical Utility of the Data
How will the data be used? The aquatic invertebrate life-cycle study would allow EPA to analyze chronic effects to freshwater invertebrates, including effects on reproductive success and growth. The effects data would be used to determine the likelihood that pirimiphos methyl would potentially impact aquatic communities, either by direct effects on invertebrates or by indirect effects on fish by reducing their food sources. **How could the data impact the Agency's future decision-making?** If future endangered species risk assessments are performed without these data, the Agency would have to assume that pirimiphos methyl may affect endangered aquatic invertebrates directly (and endangered species from other taxa indirectly), and use of pirimiphos methyl might need to be restricted in areas where endangered species could be exposed. The lack of these data will limit the flexibility the Agency and registrants have to comply with the Endangered Species Act and could result in use restrictions for pirimiphos methyl which are unnecessarily severe.